LINCOLN COUNTY
HIGH HAZARD LOCATION STUDY

PRELIMINARY

PLEASE RETURN

MORRISON - MAIERLE, INC.

HIGH HAZARD LOCATION STUDY
FOR
LINCOLN COUNTY, MONTANA
DCA Project Number 81-06-01-2

September 1981

Prepared by:

MORRISON-MAIERLE, INC.
HELENA, MONTANA

M-M Project Number 1879-01-01(30)

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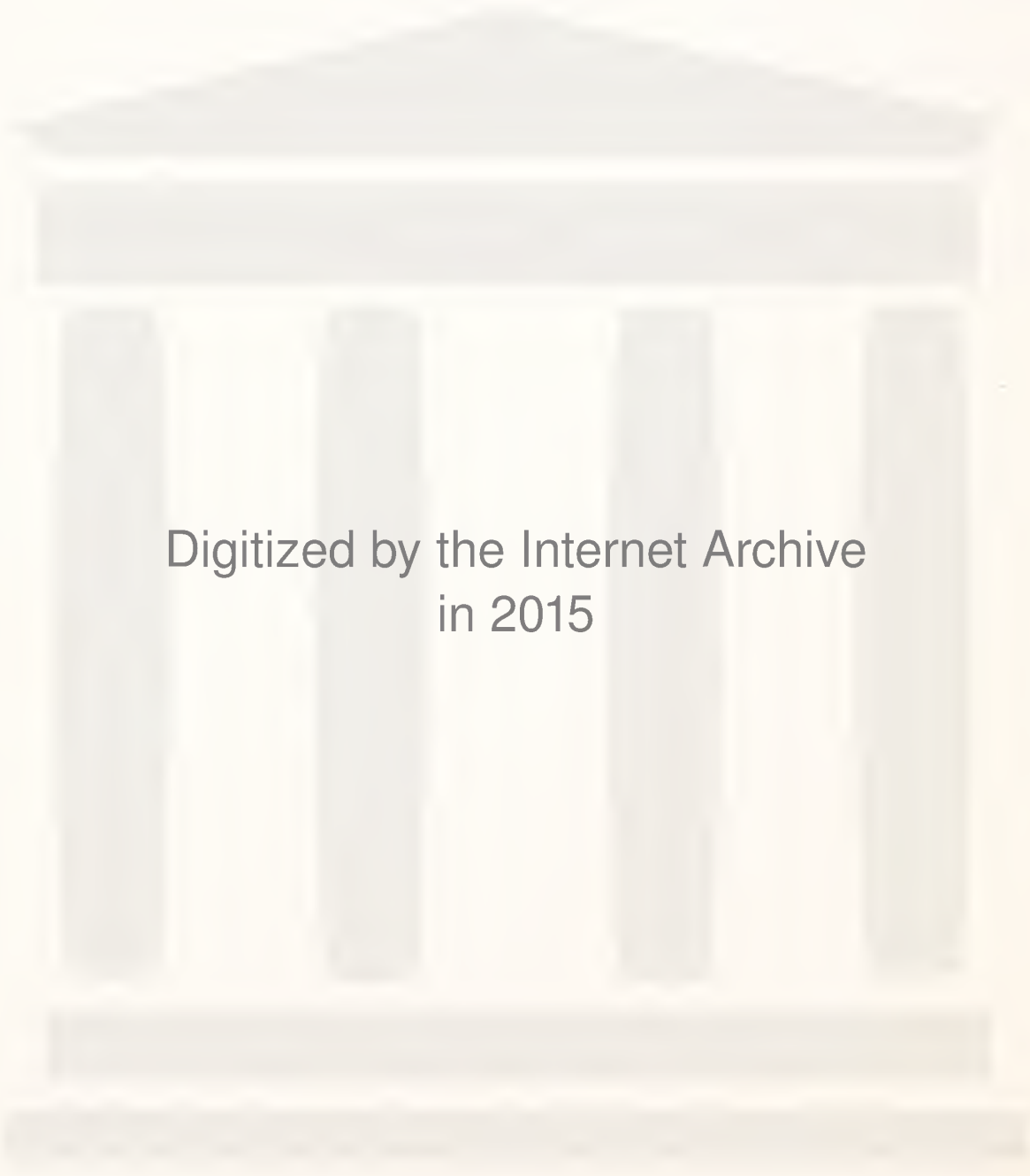


SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The following 11 sites were selected for analysis in the High Hazard Location Study by Lincoln Conty and Highway Traffic Safety, Department of Justice based on accident history and roadway characteristics:

SITE 1 - Intersection of Education Way and Parmenter Drive
SITE 2 - River Road, East
SITE 3 - Meadow Creek Road
SITE 4 - Pinkham Creek Road
SITE 5 - Pipe Creek Road, South
SITE 6 - Pipe Creek Road, North
SITE 7 - Intersection of Bobtail Creek Road and Pipe Creek Cut-off Road.
SITE 8 - River Road, West
SITE 9 - 2nd Street Extension
SITE 10 - Shaunessey Hill Junction to Golf Course Road
SITE 11 - Glen Lake Road

The locations of the sites are shown on Figures 1 through 3.

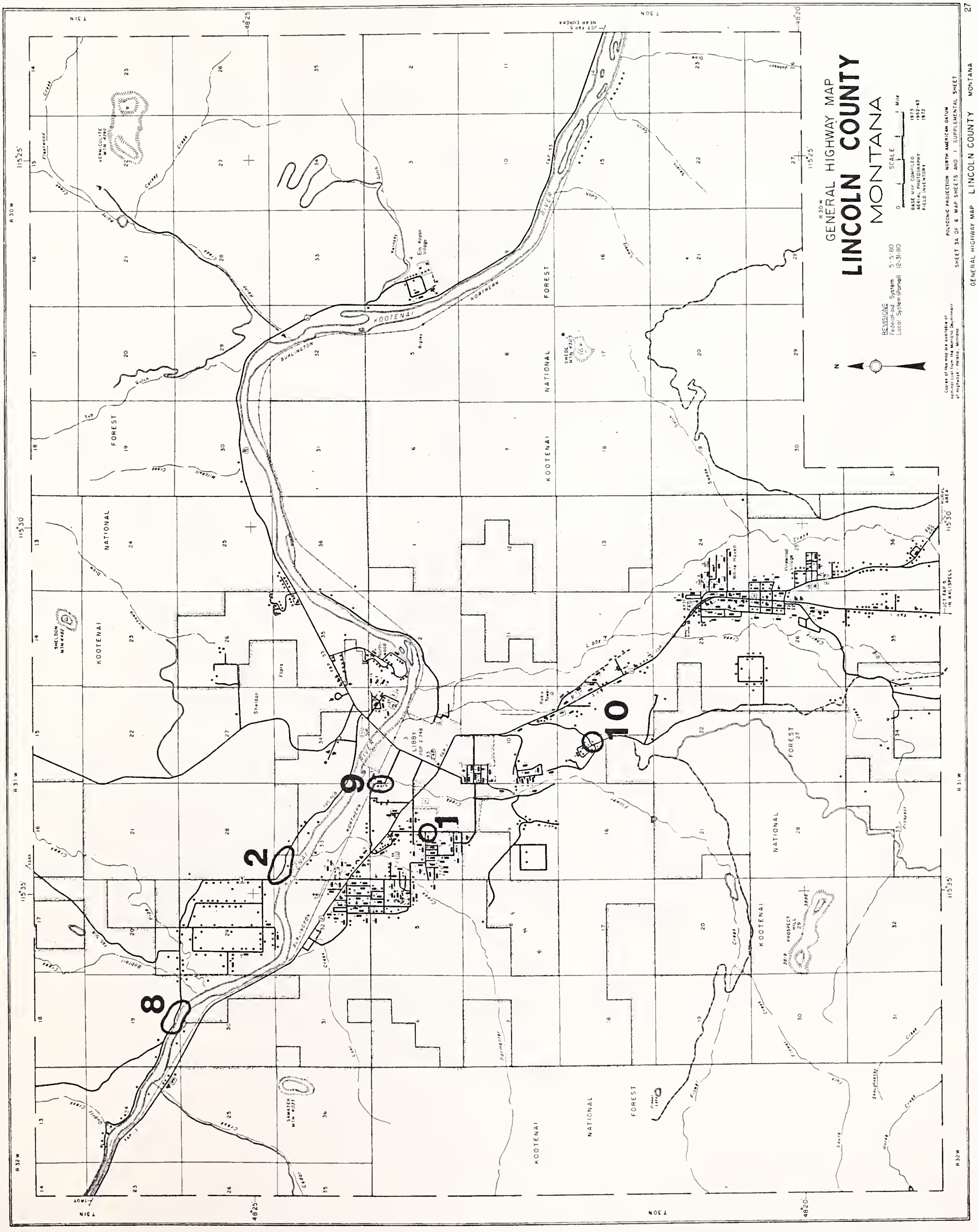
The sites were each evaluated based on procedures outlined in Report No. FHWA-RD-77-83, "Identification of Hazardous Locations" as revised and supplemented by DCA Project No. 79-04-01-01, "Preliminary Evaluation Program for High Hazard Location Study, Yellowstone County, Montana".

The following tables are included to help describe and compare the hazardousness or priority of the sites:

TABLE 1 lists the sites in the order of their Priority Indices, which include all seven partial hazard indicators combined with the cost factor.

TABLE 2 lists the sites in the order of their Hazard Indices, which include all seven partial hazard indicators.

Figure 1



GENERAL HIGHWAY MAP
LINCOLN COUNTY
MONTANA
KOOTENAI NATIONAL FOREST
KOOTENAI RIVER
LIBBY
BURLINGTON NORTHERN
1
2
8
9
10
R 30 W
R 31 W
R 32 W
T 30 N
T 31 N
GENERAL HIGHWAY MAP LINCOLN COUNTY MONTANA
27

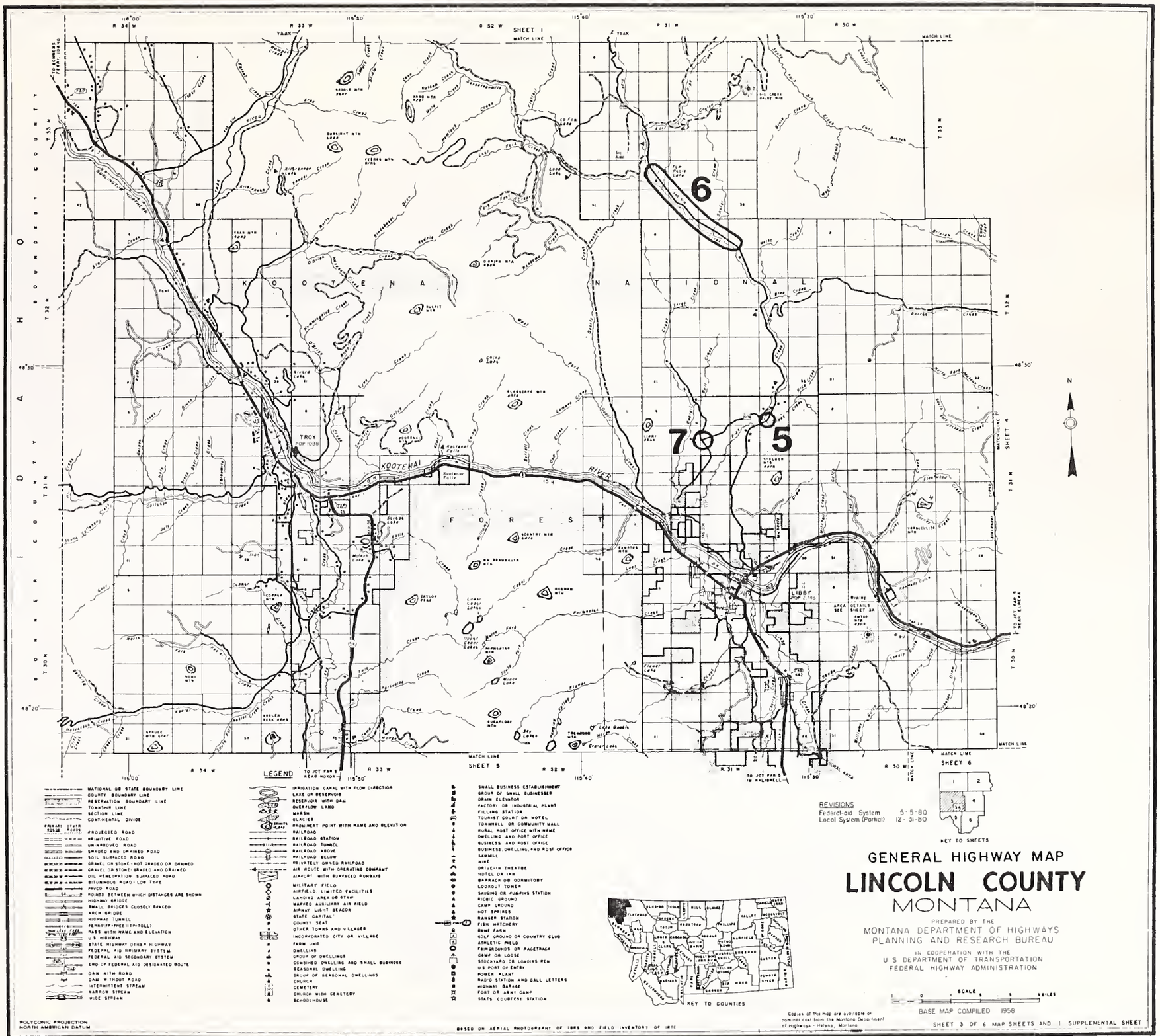
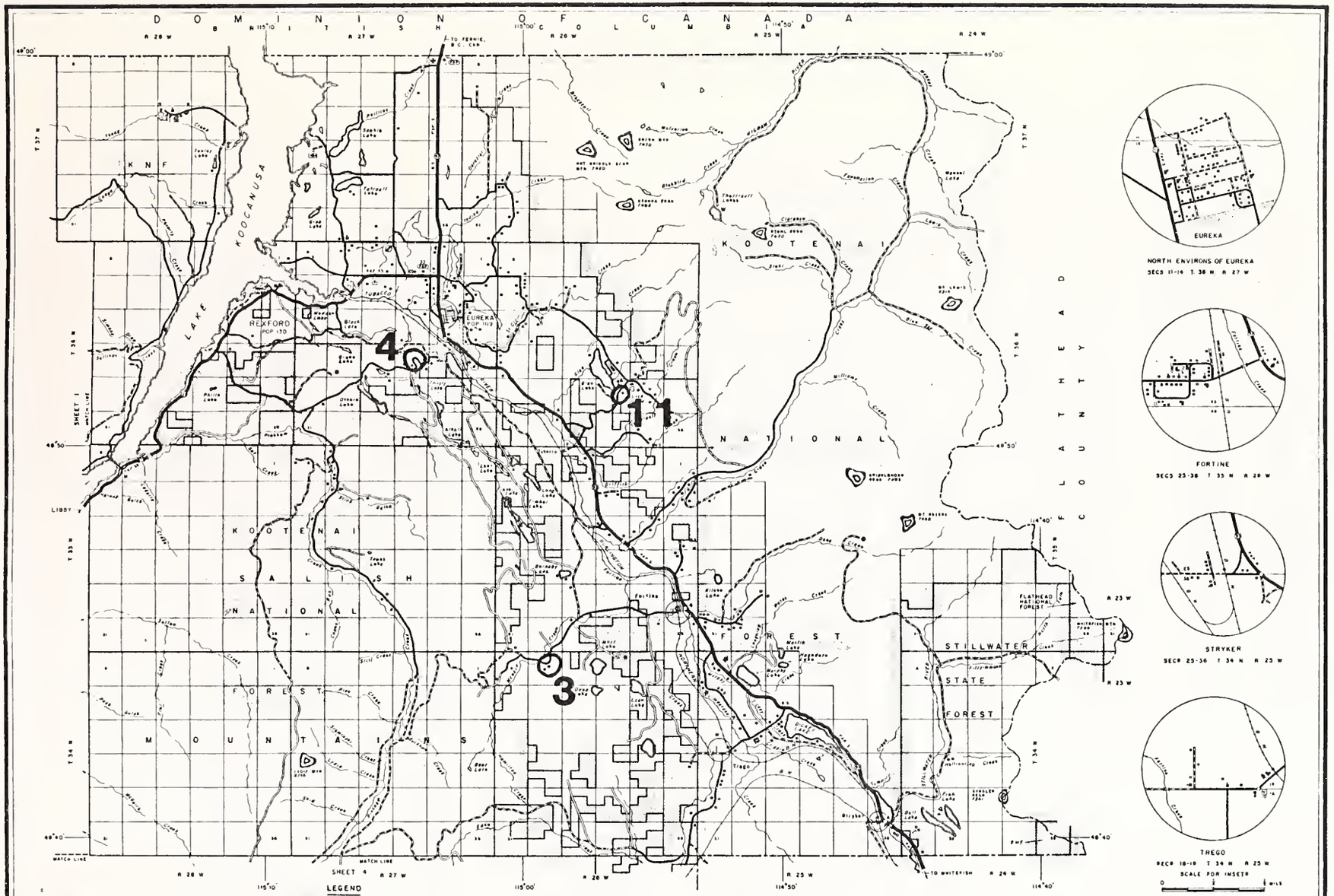

SHEET 1
SHEET 3
SHEET 4
SHEET 5
SHEET 6
MATCH LINE
KOOTENAI NATIONAL FOREST
BOUNDARY COUNTY
IDAHO
TROY
POP 1088
KOOTENAI RIVER
LIBBY
POP 2740
6
7
5
R 34 W
R 33 W
R 32 W
R 31 W
R 30 W
T 33 N
T 32 N
T 31 N
T 30 N
48°30'
48°20'
115°00'
115°50'
115°40'
115°30'
N
LEGEND
NATIONAL OR STATE BOUNDARY LINE
COUNTY BOUNDARY LINE
RESERVATION BOUNDARY LINE
TOWNSHIP LINE
SECTION LINE
CONTINENTAL DIVIDE
PROJECTED ROAD
PRIMITIVE ROAD
UNIMPROVED ROAD
SHADED AND DRAINED ROAD
SOIL SURFACED ROAD
GRAVEL OR STONE - NOT GRADED OR DRAINED
GRAVEL OR STONE - GRADED AND DRAINED
OIL PENETRATION SURFACED ROAD
BITUMINOUS ROAD - LOW TYPE
PAVED ROAD
POINTS BETWEEN WHICH DISTANCES ARE SHOWN
HIGHWAY BRIDGE
SMALL BRIDGES CLOSELY SPACED
ARCH BRIDGE
HIGHWAY TUNNEL
FERRY(F-FREE)(T-TOLL)
PASS WITH NAME AND ELEVATION
U.S. HIGHWAY
STATE HIGHWAY OTHER HIGHWAY
FEDERAL AID PRIMARY SYSTEM
FEDERAL AID SECONDARY SYSTEM
END OF FEDERAL AID DESIGNATED ROUTE
DAM WITH ROAD
DAM WITHOUT ROAD
INTERMITTENT STREAM
NARROW STREAM
WIDE STREAM
IRRIGATION CANAL WITH FLOW DIRECTION
LAKE OR RESERVOIR
RESERVOIR WITH DAM
OVERFLOW LAND
MARSH
GLACIER
PROMINENT POINT WITH NAME AND ELEVATION
RAILROAD
RAILROAD STATION
RAILROAD TUNNEL
RAILROAD ABOVE
RAILROAD BELOW
PRIVATELY OWNED RAILROAD
AIR ROUTE WITH OPERATING COMPANY
AIRPORT WITH SURFACED RUNWAYS
MILITARY FIELD
AIRFIELD, LIMITED FACILITIES
LANDING AREA OR STRIP
MARKED AUXILIARY AIR FIELD
AIRWAY LIGHT BEACON
STATE CAPITAL
COUNTY SEAT
OTHER TOWNS AND VILLAGES
INCORPORATED CITY OR VILLAGE
FARM UNIT
DWELLING
GROUP OF DWELLINGS
COMBINED DWELLING AND SMALL BUSINESS
SEASONAL DWELLING
GROUP OF SEASONAL DWELLINGS
CHURCH
CEMETERY
CHURCH WITH CEMETERY
SCHOOLHOUSE
SMALL BUSINESS ESTABLISHMENT
GROUP OF SMALL BUSINESSES
GRAIN ELEVATOR
FACTORY OR INDUSTRIAL PLANT
FILLING STATION
TOURIST COURT OR MOTEL
TOWNHALL OR COMMUNITY HALL
RURAL POST OFFICE WITH NAME
DWELLING AND POST OFFICE
BUSINESS AND POST OFFICE
BUSINESS, DWELLING, AND POST OFFICE
SAWMILL
MINE
DRIVE-IN THEATRE
HOTEL OR INN
BARRACK OR DORMITORY
LOOKOUT TOWER
SAWING OR PUMPING STATION
PICNIC GROUND
CAMP GROUND
HOT SPRINGS
RANGER STATION
FISH HATCHERY
GAME FARM
GOLF GROUND OR COUNTRY CLUB
ATHLETIC FIELD
FAIRGROUNDS OR RACETRACK
CAMP OR LODGE
STOCKYARD OR LOADING REN
U.S. PORT OF ENTRY
POWER PLANT
RADIO STATION AND CALL LETTERS
HIGHWAY GARAGE
FORT OR ARMY CAMP
STATE COURTESY STATION
KEY TO COUNTIES
KEY TO SHEETS
REVISIONS
Federal-aid System 5-5-80
Local System (Partial) 12-31-80
GENERAL HIGHWAY MAP
LINCOLN COUNTY
MONTANA
PREPARED BY THE
MONTANA DEPARTMENT OF HIGHWAYS
PLANNING AND RESEARCH BUREAU
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
BASE MAP COMPILED 1958
SHEET 3 OF 6 MAP SHEETS AND 1 SUPPLEMENTAL SHEET
POLYCONIC PROJECTION
NORTH AMERICAN DATUM
BASED ON AERIAL PHOTOGRAPHY OF 1955 AND FIELD INVENTORY OF 1976
Copies of this map are available at nominal cost from the Montana Department of Highways - Helena, Montana

Figure 2



NORTH ENVIRONS OF EUREKA
SECS 11-14 T. 38 N. R. 27 W

FORTINE
SECS 25-36 T 35 N R 28 W

STRYKER
SEC# 25-36 T 34 N R 25 W

TREGO
SEC# 18-19 T 34 N R 25 W
SCALE FOR INSET#
0 1 MILE

LEGEND

- NATIONAL OR STATE BOUNDARY LINE
- COUNTY BOUNDARY LINE
- RESERVATION BOUNDARY LINE
- TOWNSHIP LINE
- SECTION LINE
- CONTINENTAL DIVIDE
- PROJECTED 4WAD
- PRIMITIVE ROAD
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- BITUMINOUS ROAD - LOW TYPE
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- POINTS BETWEEN WHICH DISTANCES ARE SHOWN
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- TERMINUS (PAVED) (WITH TOLL)
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- SUB ROUTE WITH OPERATING COMPANY
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- RURAL POST OFFICE WITH NAME
- DWELLING AND POST OFFICE
- BUSINESS AND POST OFFICE
- BUSINESS, DWELLING AND POST OFFICE
- SAWMILL
- MINE
- OIL OR GAS WELLS
- OIL TANK
- GAS TANK
- GROUP OF GAS AND OIL STORAGE TANKS
- SHIPPING OR PUMPING STATION
- PICNIC GROUND
- CAMP GROUND
- HOT SPRINGS
- RANGER STATION
- FISH HATCHERY
- GAME FARM
- GOLF GROUND OR COUNTRY CLUB
- ATHLETIC FIELD
- FAIRGROUNDS OR RACETRACK
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- RADIO STATION AND CALL LETTERS
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- STATE COURTESY STATION

N

KEY TO SHEETS

KEY TO COUNTIES

FLATHEAD COUNTY

REVISIONS
Federal-aid System 5-5-80
Local System (Partial) 12-31-80

GENERAL HIGHWAY MAP
LINCOLN COUNTY
MONTANA

PREPARED BY THE
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SCALE 0 1 0 1 MILES

BASE MAP COMPILED 1958

SHEET 2 OF 6 MAP SHEETS AND 1 SUPPLEMENTAL SHEET

POLYCONIC PROJECTION
NORTH AMERICAN DATUM

BASED ON AERIAL PHOTOGRAPHY OF 1968 AND FIELD INVENTORY OF 1972

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Figure 3

TABLE 3 lists the sites based on the total of the four non-accident indicators. The four non-accident indicators are volume/capacity ratios, sight distance, driver expectancy and information systems deficiencies.

TABLE 4 compares the rankings established by Tables 1 through 3.

TABLE 5 is the recommended order of priority for the 11 sites included in the study.

The order of priority in Table 5 is similar to the list in Table 1, based on Priority Index, except that Site 4 was moved to rank 8 and Site 8 was moved to rank 9.

Site 4 has no recorded accidents during the five year study period so its total Hazard Index and its Priority Index are very low. It ranks second among the eleven sites, however, based only on the non-accident indicators, indicating that there is a high potential for accidents. For that reason and since the improvement costs for Site 4 are only $975, it was moved ahead of Sites 1, 7 and 8 which have higher improvement costs and lower non-accident indicatiors.

Site 8 was moved ahead of Site 1 because, though the cost of improvements are high, giving it a lower Priority Index, it ranks first among the sites based on the Hazard Index. Site 1 is ranked 10th on the Hazard Index.

It is recommended that the improvements recommended in this report be completed in the following 3 phases:

Phase 1 would include short term improvements for the first 8 sites recommended on Table 5, Sites 2, 3, 4, 5, 6, 9, 10 and 11. These improvements involve only signing, striping and brush removal and could be completed for a total cost of $5725. Using county forces, the cost may be less.

Phase II would include the short term improvements recommended for the last 3 sites on Table 5, Sites 1, 7 and 8. These improvements include signing and striping as well as brush removal and excavation. The total cost for these improvements is estimated to be $10,125.

Phase III would include the long term improvements recommended for Sites 9 and 10. These improvements involve complete reconstruction of roadways and intersections.

In addition to the short term and long term improvements mentioned above, it is recommended that, as pavement is worn out and replaced on sites including horizontal curves, reconstruction should include proper superelevation of curves based on an engineering design and construction staking.

TABLE 1

LIST OF SITES IN ORDER OF PRIORITY INDEX

RANK	SITE NUMBER	PRIORITY INDEX
1	11	66.6
2	10	66.5
3	9	64.4
4	5	62.7
5	3	58.4
6	6	56.1
7	2	54.2
8	1	50.1
9	8	49.2
10	7	43.8
11	4	42.2

TABLE 2

LIST OF SITES IN ORDER OF HAZARD INDEX

RANK	SITE NUMBER	PRIORITY INDEX
1	8	62.2
2	11	59.4
3	10	56.8
4	9	53.1
5	5	51.1
6	7	48.1
7	3	47.9
8	6	45.0
9	2	39.8
10	1	34.01
11	4	25.2

TABLE 3

LIST OF SITES BY NON-ACCIDENT INDICATORS

(V/C RATIO, S.D. RATIO, DRIVER EXPECTANCY, INFO. SYSTEM DEF.)

RANK	SITE NUMBER	SUM OF FOUR PARTIAL H.I.'S
1	10	27.5
2	4	25.2
3	8	23.6
4	11	23.0
5	9	22.8
6	3	22.2
7	5	21.4
8	1	17.6
9	7	17.0
10	2	12.6
11	6	6.3

TABLE 4

COMPARISON OF RANKING

RANK	SITES BY PRIORITY INDEX	SITES BY HAZARD INDEX	SITES BY NON-ACCIDENT INDICATORS
1	11	8	10
2	10	11	4
3	9	10	8
4	5	9	11
5	3	5	9
6	6	7	3
7	2	3	5
8	1	6	1
9	8	2	7
10	7	1	2
11	4	4	6

TABLE 5
RECOMMENDED ORDER OF PRIORITY
FOR SHORT TERM IMPROVEMENTS

RANK	SITE NUMBER
1	11
2	10
3	9
4	5
5	3
6	6
7	2
8	4
9	8
10	1
11	7

STUDY METHODOLOGY

INTRODUCTION

Eleven sites were selected for this study by Lincoln County and Highway Traffic Safety of the Montana Department of Justice. This study includes the following phases for the evaluation of the sites:

1. Collection and Evaluation of Accident Data.
2. Field Inspection and Survey.
3. Analysis of Data and Calculation of Hazard Indices.
4. Preliminary Design and Calculation of Cost Factor.
5. Establishment of a Priority Index.

The following sections explain and discuss each of the five phases.

COLLECTION AND EVALUATION OF ACCIDENT DATA

This phase involves obtaining copies of all accident reports available in the microfilm files of the Montana Department of Justice for the accident period selected for the study. The data on the reports were then analyzed by plotting each accident on a "Collision Diagram" and summarizing the data on an "Accident Data" Form. (The "Collision Diagram" and the "Accident Data" form are included with the section of this report discussing each site.) The accident data was then available to the traffic engineer as each site was field inspected and surveyed.

FIELD INSPECTION AND SURVEY

After obtaining the above mentioned accident data, each site was reviewed and studied in the field. This field survey and inspection included:

1. Measurement and survey to determine existing geometrics. Information obtained included width of pavement, degree of horizontal curvature, vertical grades and superelevation.

2. Measurement of sight distances to the hazard (curve or intersection).
3. Traffic counts. In most cases counts were made using an automatic traffic counter over a period of 24 hours.
4. Other miscellaneous data were obtained including posted speed limit, distance to and type of obstructions, character of adjacent and connecting roads, type and character of traffic and other items that might affect safety at the sites.
5. The "Information Systems Deficiencies Rating Form" and the "Driver Expectancy Problems Rating Form" were completed in the field for each site.

ANALYSIS OF DATA AND CALCULATION OF HAZARD INDICES

Each of the 11 sites selected was evaluated for hazardousness and was assigned an indicator value (I.V.) for each of the following seven measures or indicators:

1. Number of Accidents
2. Accident Rate
3. Accident Severity
4. Volume/Capacity Ratio
5. Sight distance
6. Driver Expectancy
7. Information System Deficiencies

After the seven indicator values for each site were established, partial hazard indices were assigned based on the following relationships:

Partial H.I. = 0.164 (I.V.) Number of Accidents
0.225 (I.V.) Accident Rate
0.191 (I.V.) Accident Severity
0.082 (I.V.) Volume/Capacity Ratio
0.074 (I.V.) Sight Distance
0.149 (I.V.) Driver Expectancy
0.115 (I.V.) Information System Deficiencies

The total hazard index for each site is the sum of the seven partial H.I.'s calculated.

DISCUSSION OF HAZARD INDEX (H.I.)

Each of the indicators used in the Hazard Index equation is a measure of some aspect of the hazardousness of a particular location. Some indicators are stronger than others, of course, and the individual indicator values are therefore weighted according to their ability to predict future accident experience. Larger values indicate higher degrees of hazardousness.

Two indicators discussed in the FHWA report (Report FHWA-RD-77-83, Identification of Hazardous Locations) have not been included. These are traffic conflicts and erratic maneuvers. These indicators are not recommended for use because most of the roads maintained by the County are relatively low volume roads. The sampling for either of these parameters would require observation for periods of from several hours to days in order to get a statistically valid sample. It is not felt that the benefit gained would justify the cost or the time involved with either of these parameters.

The weighting factors used in the Hazard Index formula recommended are basically identical to those suggested in the FHWA report. The weighting factors have been adjusted however to account for the exclusion of the Traffic Conflicts and Erratic Maneuvers indicators. Indicator Values range from 0 to 100. Charts for converting raw data to Indicator Values for each of the seven indicators used are included in this report.

Following is a brief explanation of each of the indicators recommended for inclusion in the Hazard Index formula and a discussion of the modifications to the Indicator Values presented in the FHWA and DCA reports.

INDICATOR 1: NUMBER OF ACCIDENTS

The data used to arrive at an Indicator Value for number of accidents is the average number of accidents per year using reports for a three year period.

Because of the relatively low number of accidents in Lincoln County and because of the reliability of accident records in the county from 1976 to the present, it was decided that a period of five years should be used instead of the three year period recommended by the report for all three of the "accident" indicators (Number of Accidents, Accident Rate and Accident Severity).

Figure 4 shows the relationship between Average Number of Accidents per year and Indicator Values.

INDICATOR 2: ACCIDENT RATE

The data used to arrive at an Indicator Value for accident rate is the number of accidents per million vehicles entering a location. Again a five year period was used to account for the random occurance of accidents. The accident rate will then be determined by dividing the number of accidents by the sum of the approach volumes.

Figure 5 shows the relationship between ACC/MEV and Indicator Value.

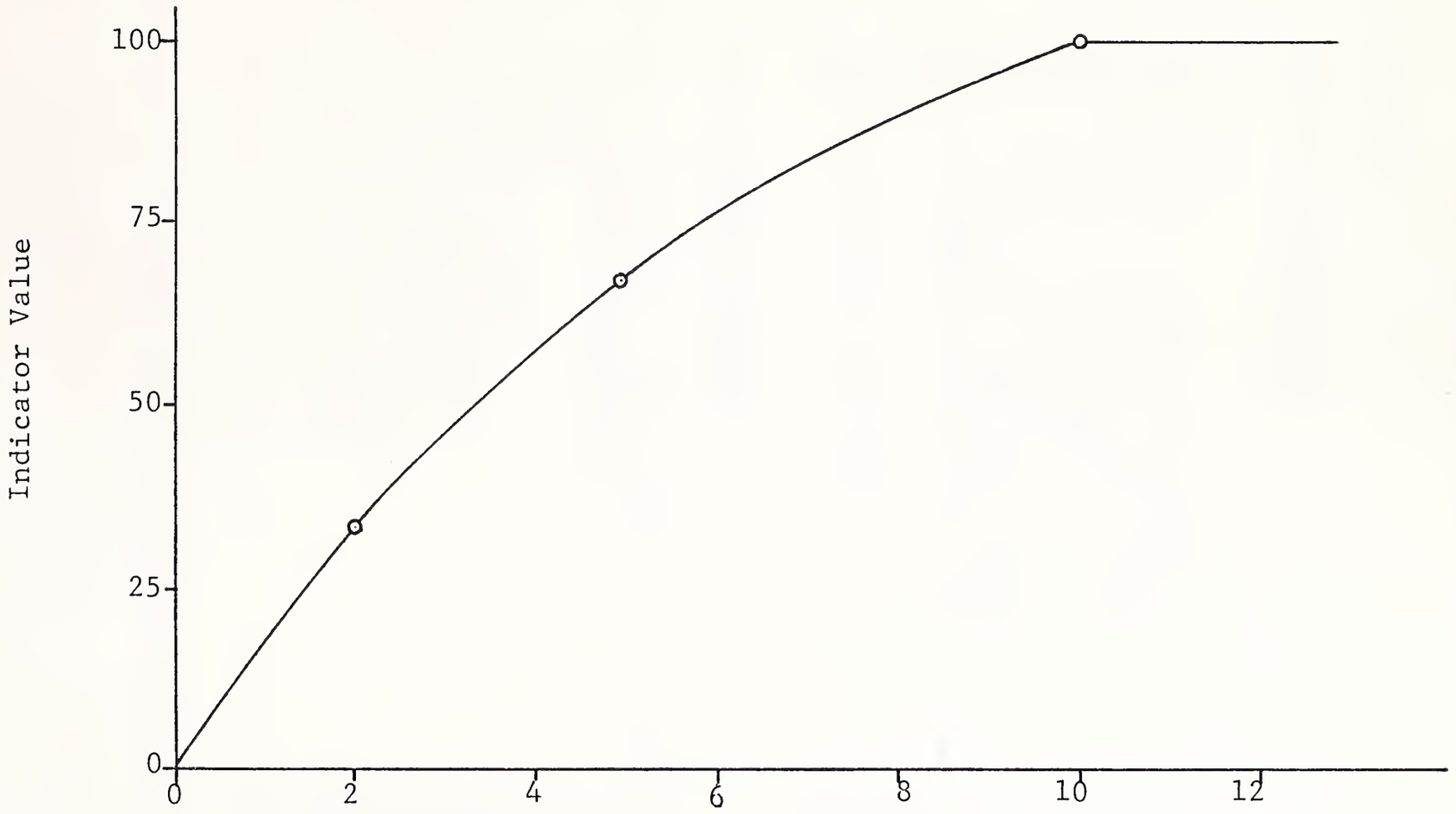
INDICATOR 3: ACCIDENT SEVERITY

This indicator provides a means of identifying the hazardousness of a location based on the severity of accidents at that location. If two locations have approximately equal accident rates a difference in severity will be a strong indicator of which location is the more hazardous.

The data input for this indicator is the "Average Relative Severity Index" (RSI). Again accidents over a five year period should be used to determine the RSI. The FHWA report recommends using RSI values as shown in Table 6. It should be noted that the RSI value for a particular location is not directly dependent on whether an accident is a personal injury accident or involves a fatality. The average number of fatalities, injuries, and property damage for all accidents within a category were taken into consideration when the RSI values were developed. In this manner a random accident involving a fatality is not overemphasized.

Indicator Values for Number of Accidents.

Figure 4



Indicator Values for Accident Rate.

Figure 5

Table 6. RELATIVE SEVERITY INDEX

Type of Accident	RSI	
	Urban	Rural
Multi-Vehicle, At Intersection		
Entering at angle	$ 4,300	$ 14,400
From same direction -- both going straight	2,800	5,100
From same direction -- one turn, one straight	2,500	5,100
From same direction -- one stopped	3,800	5,200
From same direction -- all others	2,000	6,300
From opposite direction -- both going straight	4,000	20,000
From opposite direction -- one left turn, one straight	4,400	15,400
From opposite direction -- all others	2,700	3,800
Not stated	3,800	5,200
Multi-Vehicle, Non-Intersection		
Going opposite direction -- both moving	$ 4,400	$ 19,600
Going same direction -- both moving	2,900	8,100
One car parked	1,600	2,400
One car stopped in traffic	4,200	6,800
One car entering parked position	1,900	2,300
One car leaving parked position	1,200	2,700
One car entering alley or driveway	3,400	6,000
One car leaving alley or driveway	2,000	4,400
All others	1.700	7,600
Not stated	3,400	6,000
Motor Vehicle with Pedestrian, At Intersection and Non-Intersection		
Vehicle going straight	$ 20,000	$ 49,000
Vehicle turning right	13,600	11,200
Vehicle turning left	17,100	11,200

Table 6 - Continued

Type of Accident	RSI	
Multi-Vehicle, At Intersection	Urban	Rural
Motor Vehicle with Pedestrian, At Intersection and Non-Intersection Continued....		
Vehicle backing	20,600	11,200
All others	14,500	11,200
Not stated	11,200	11,200
Single Vehicle, at Intersection		
Collision with train	$ 26,700	$ 39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	5,500	7,000
Overturned in road	9,200	7,500
Left road	5,200	12,300
Single Vehicle, Non-Intersection		
Collision with train	$ 26,700	$ 39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	6,300	9,200
Overturned in road	10,000	9,400
Left road at curve	7,600	12,400
Left road on straight road	5,200	10,500
Other One Motor Vehicle, At Intersection and Non-Intersection		
Fell from moving vehicle	$ 15,000	$ 57,200
Colision with animal	4,800	1,800
Collision with other object	4,700	4,400
All others	5,200	2,000
Not stated	3,200	3,400

Figure 6 shows the relationship between average Relative Severity Index and Indicator Value.

INDICATOR 4: VOLUME/CAPACITY RATIO

The Volume/Capacity Ratio Indicator incorporates the basic volume information for a location, and "normalizes" this data to compensate, to some extent, for the number of lanes, traffic mix, control devices, etc. This enables all classes of road to be compared equally. The V/C Indicator does not rely on accident records.

The Volume/Capacity Ratio as used here takes the following form:

$$\frac{V}{C} = \frac{ADT}{(24\ (Capacity)}$$

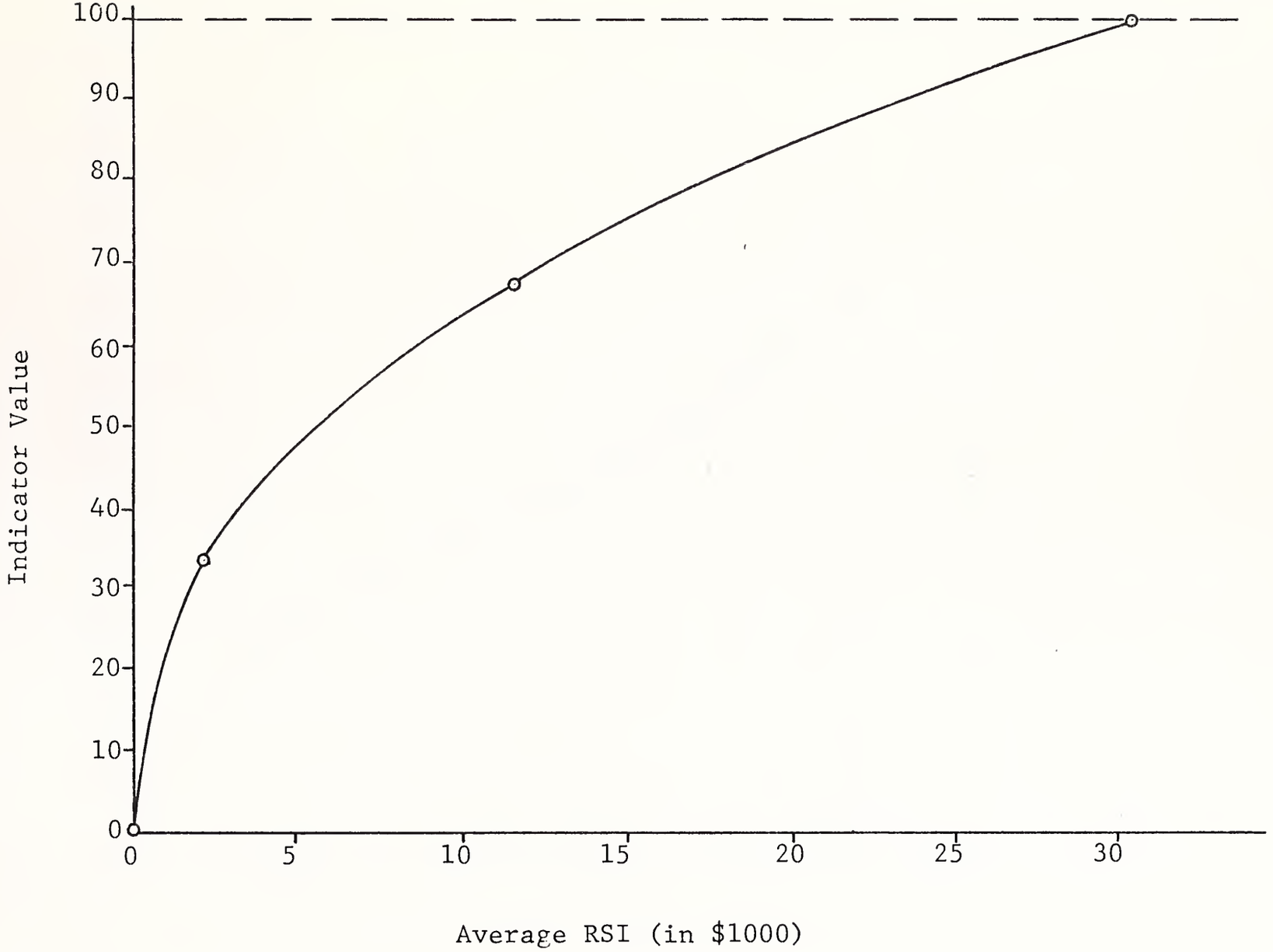
While this is not the standard expression for the volume/capacity ratio, it does provide an idea of the average use of the facility throughout the day and gives emphasis to ADT. The capacity, as used in the equation, is actually equal to the service volume at level C, as defined in the Highway Capacity Manual.

Figure 7 shows the relationship between V/C Ratio and Indicator Value.

INDICATOR 5: SIGHT DISTANCE

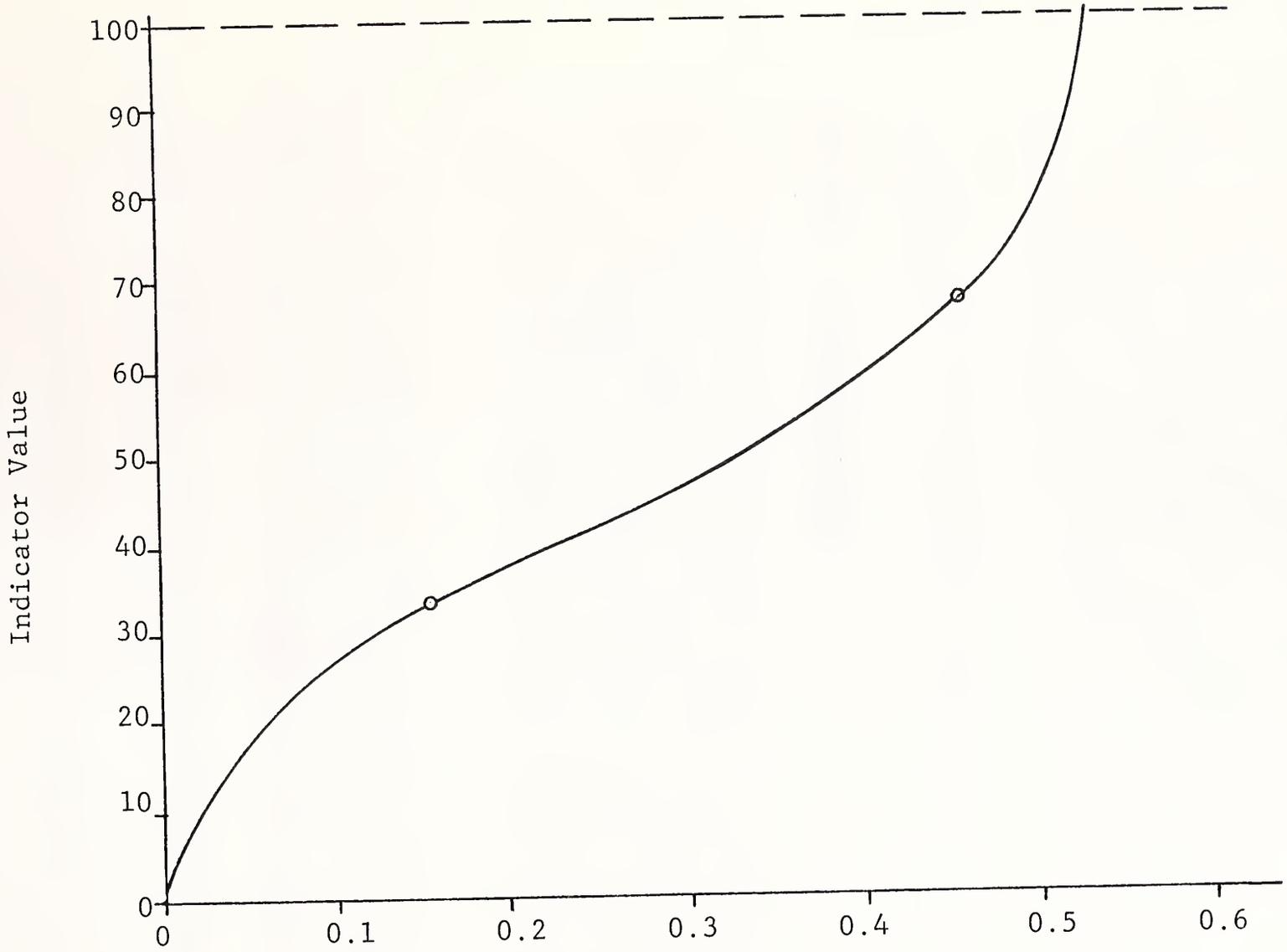
Sight distance is an obvious indicator of the hazardousness of a particular location. This indicator also does not rely totally on accident records but is a function of the roadway environment and geometry.

The data used to determine this indicator is the ratio of sight distance present to that specified as desirable in the appropriate AASHTO guides for the type of location involved. Actual sight distances were measured in the field.



Indicator value for accident severity.

Figure 6



Indicator values for V/C ratio.

Figure 7

For a non-intersection location the minimum desirable sight distance is the safe stopping sight distance (SSSD) on approaches to the potential hazard.

A Sight Distance Ratio Indicator must be determined for each approach to a hazardous location. However, a single Indicator Value must be determined for a particular location for use in the Hazard Index formula. To accomplish this, the FHWA report recommends that a weighted average of the two highest Indicator Values be used as the Indicator Value for that location. The highest Indicator Value would be weighted 2.0 and the next highest value weighted 1.0.

Figure 8 shows the relationship between Sight Distance Ratio and Indicator Value.

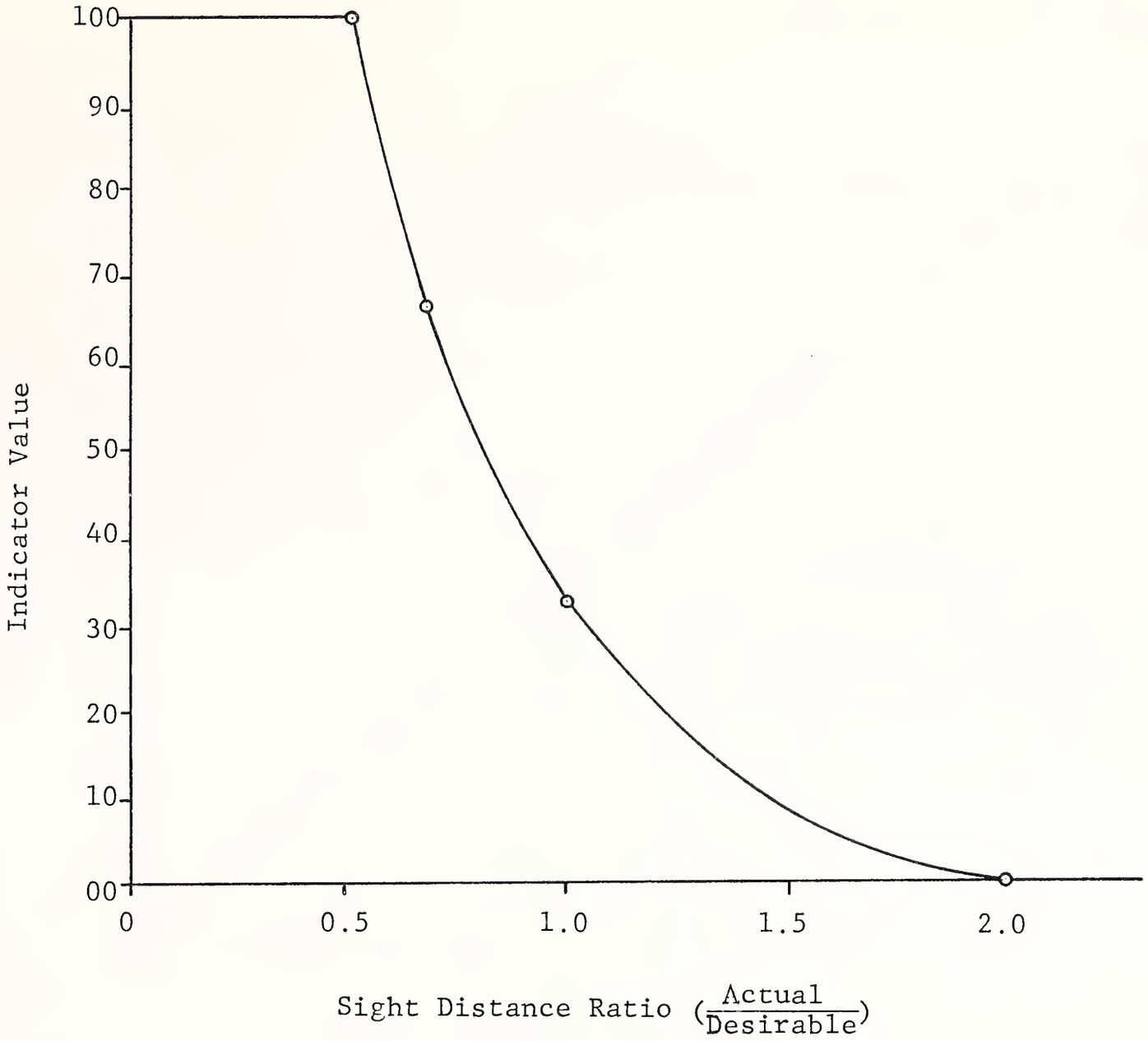
INDICATOR 6: DRIVER EXPECTANCY

Driver Expectancy relates to the readiness of the driver to respond to events, situations, or the presentation of information. It is a subjective parameter which attempts to deal with the drivers experience rather than an event or the roadway. For example, horizontal curves immediately beyond the crest of vertical curves or stop signs around horizontal curves are locations where driver expectancy contributes to the hazardousness of a location.

The data input for this indicator is a Driver Expectancy Problems Rating for each approach to the site under consideration. Each site was visited by one or more individuals, and the average of the values assigned to each approach by each individual was be used as the approach rating.

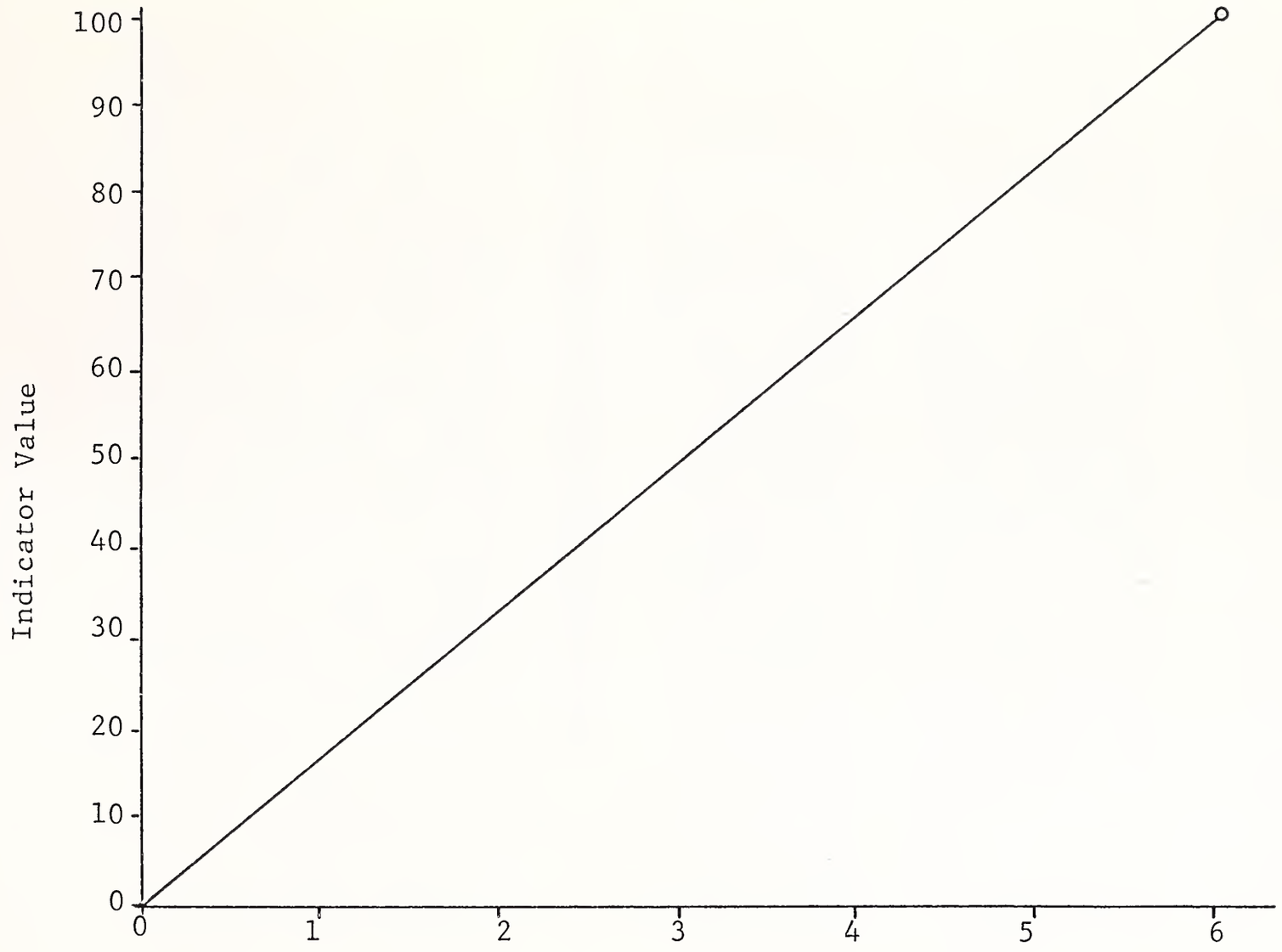
Figure 9 shows the relationship between Driver Expectancy Problems Rating and Indicator Value.

As with the Sight Distance Indicator, an Indicator Value is determined for each approach to a particular location. Then the weighted average of the two highest Indicator Values is determined and this Value is used as



Indicator values for sight distance.

Figure 8



Indicator values for driver expectancy.

Figure 9

the Indicator Value for that location. Again, the highest Indicator Value is weighted 2.0 and the next highest Value is weighted 1.0.

INDICATOR 7: INFORMATION SYSTEM DEFICIENCIES

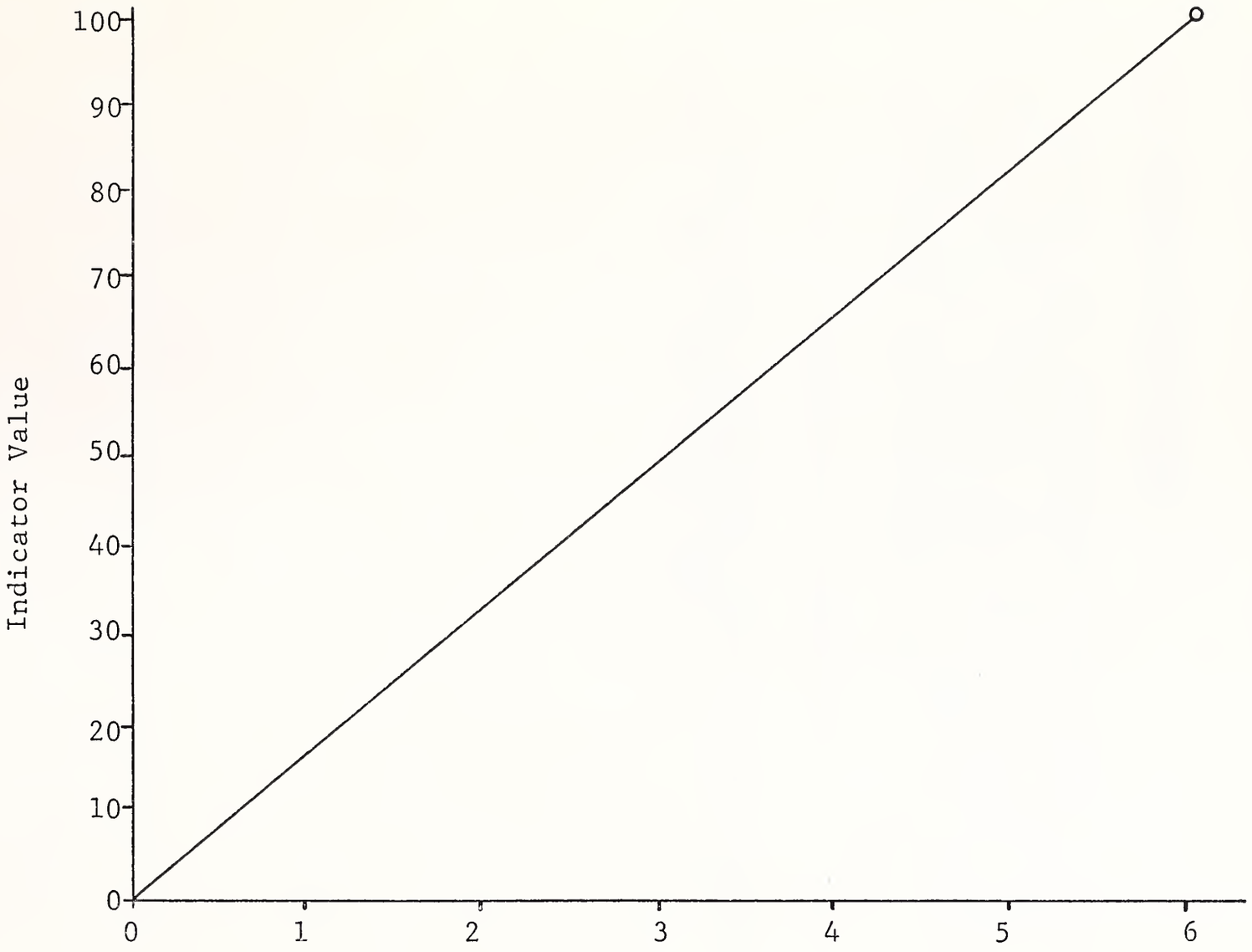
This is a subjective indicator of the adequacy of the information systems (signing, striping, etc.) at a location to enable the driver to make correct judgements and decisions. An inadequate information system creates a hazardous situation.

The data input for this indicator is an Information System Deficiencies Rating for each approach to the site under consideration. As with the Driver Expectancy Problems Rating, each approach was rated by one or more individuals and the average of these ratings was used as the approach rating. The Information System Deficiencies Rating form provides for rating each approach on a scale from 0 (excellent) through 6 (critical).

Figure 10 shows the relationship between Information System Deficiencies Rating and Indicator Value. An Indicator Value is determined for each approach and the weighted average of the two highest values is used as the Indicator Value for that location again using weighting factors of 2.0 and 1.0 respectively.

PRELIMINARY DESIGN AND CALCULATION OF COST FACTOR

After analysis of the accident data and a study of the existing conditions, recommended improvements were designed for short term and in some cases long term improvement. Short term improvements generally included signing, striping or placement of guardrail and projects which can normally be completed by county forces and do not require a construction contract. Short term improvements do not require right-of-way. Long term improvements are generally projects requiring reconstruction or realignment of a curve or intersection and generally require a construction contract and sometimes additional right-of-way.



Indicator values for information system deficiencies.

Figure 10

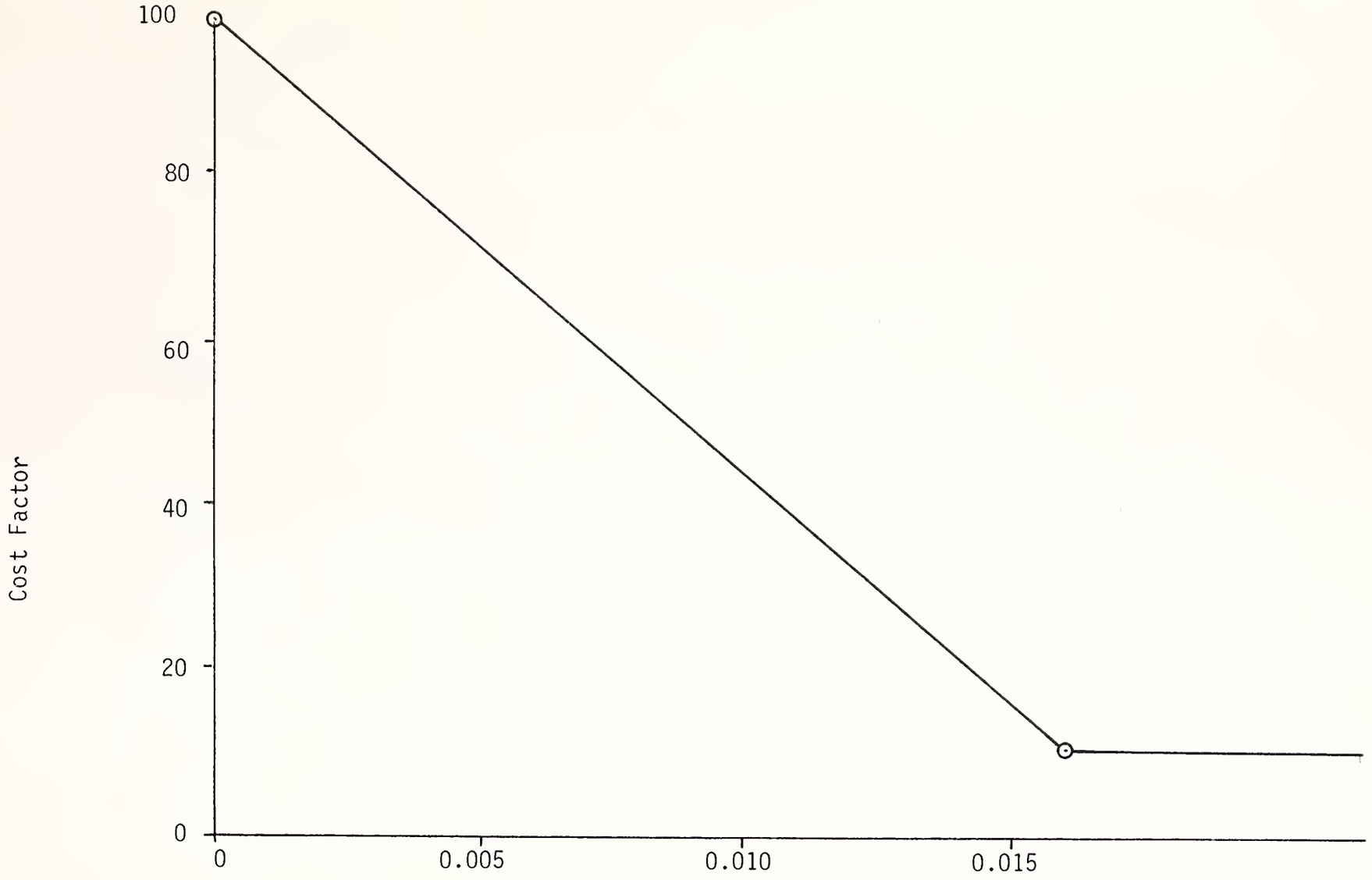
A cost per vehicle was then determined by dividing the cost of the short term improvements by the total number of vehicles entering the intersection over a period of five years. Five years is the normal design life for signing. A cost factor was then developed for each sight using Figure 11.

ESTABLISHMENT OF PRIORITY INDEX

The final step in the evaluation of the hazardous locations was to develop a Priority Index (P.I.) for each location. The Priority Index is a weighted average of the Hazard Index and the Cost Factor. The Hazard Index is weighted 0.75 and the Cost Factor is weighted 0.25. The Priority Index formula therefore takes the following form:

$$P.I. = 0.75\ (H.I.) + 0.25\ (C.F.)$$

A priority list was prepared by ranking the locations from highest Priority Index to lowest Priority Index.



Form for determination of cost factor.

Figure 11

SITE 1

SITE NUMBER 1 - INTERSECTION EDUCATION WAY AND PARMENTER DRIVE

LOCATION

Site 1 includes the T intersection of Education Way and Parmenter Drive just south of the Libby City Limits. Education Way goes from the Junior High School north to U.S. 2 at Libby High School. Traffic includes school bus traffic and pedestrian traffic (school children) as well as residential traffic.

EXISTING CONDITIONS

Both Education Way and Parmenter Drive have asphalt pavements--Education Way is 24-feet wide and Parmenter Drive is 18 feet wide. The T intersection includes a right turn lane, with a radius of 140 feet, from the north approach on Education Way to the west approach, Parmenter Drive. Grades are uniform and flat. There is no pavement striping. There is a stop sign, partially obscured by trees on the west approach and a SPEED LIMIT 25 sign just south of the intersection. ADT was determined to be 430 vehicles per day on the west leg, 1730 vehicles per day on the north leg and 1710 vehicles per day on the south leg based on 24 hour machine counts and on peak hour turning movement counts. The truck traffic is estimated to be 10%. Sight distance is greater than twice the recommended safe stopping sight distance. There is a large amount of pedestrian traffic, mostly school children, passing through the intersection. The posted speed is 25 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

There were four accidents recorded at the intersection during the five year period from 1976 to 1980. All of the accidents involved drivers attempting to turn from Education Way to Parmenter Drive. Three of the four accidents were sideswipes occuring during right turns from Education Way to Parmenter Drive. Three of the four accidents were on icy roads and all

of the accidents occurred during daylight. Though there are no accidents reported involving pedestrians, there is a high potential. During traffic counting and surveying, several near misses were observed as pedestrians, crossing the right turn lane, were not visible to drivers turning from Education Way to Parmenter Drive.

SHORT TERM IMPROVEMENTS

It is recommended that the right turn lane be removed, as shown on the Short Term Improvements sketch, for the following reasons:

1. The large amount of school pedestrian traffic cannot be accommodated safely across the right turn lane. Because of the sharp curve and the limited sight distance, pedestrians are not clearly visible to drivers using the right turn lane.

2. Three of the four accidents recorded at the intersection involved drivers attempting to negotiate the right turn lane from the north leg to the west leg.

3. Traffic volumes at the intersection do not require a right turn lane.

With vehicle traffic excluded from the right turn lane, the area can be used to provide a space for pedestrians and bicyclists to go around the corner without entering driving lanes.

The estimated cost of short term improvements is $1,150.00.

Short term improvements should also include brush and weed removal to improve site distance around the curve.

LONG TERM IMPROVEMENTS

No long term improvements are recommended.

ACCIDENT DATA

SITE NUMBER 1 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
		4		

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
1	1	1	1			

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
									1	2	1

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
1			3	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
4				

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
4			

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES			2		
FATALITIES					
P. D. O.			2		

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

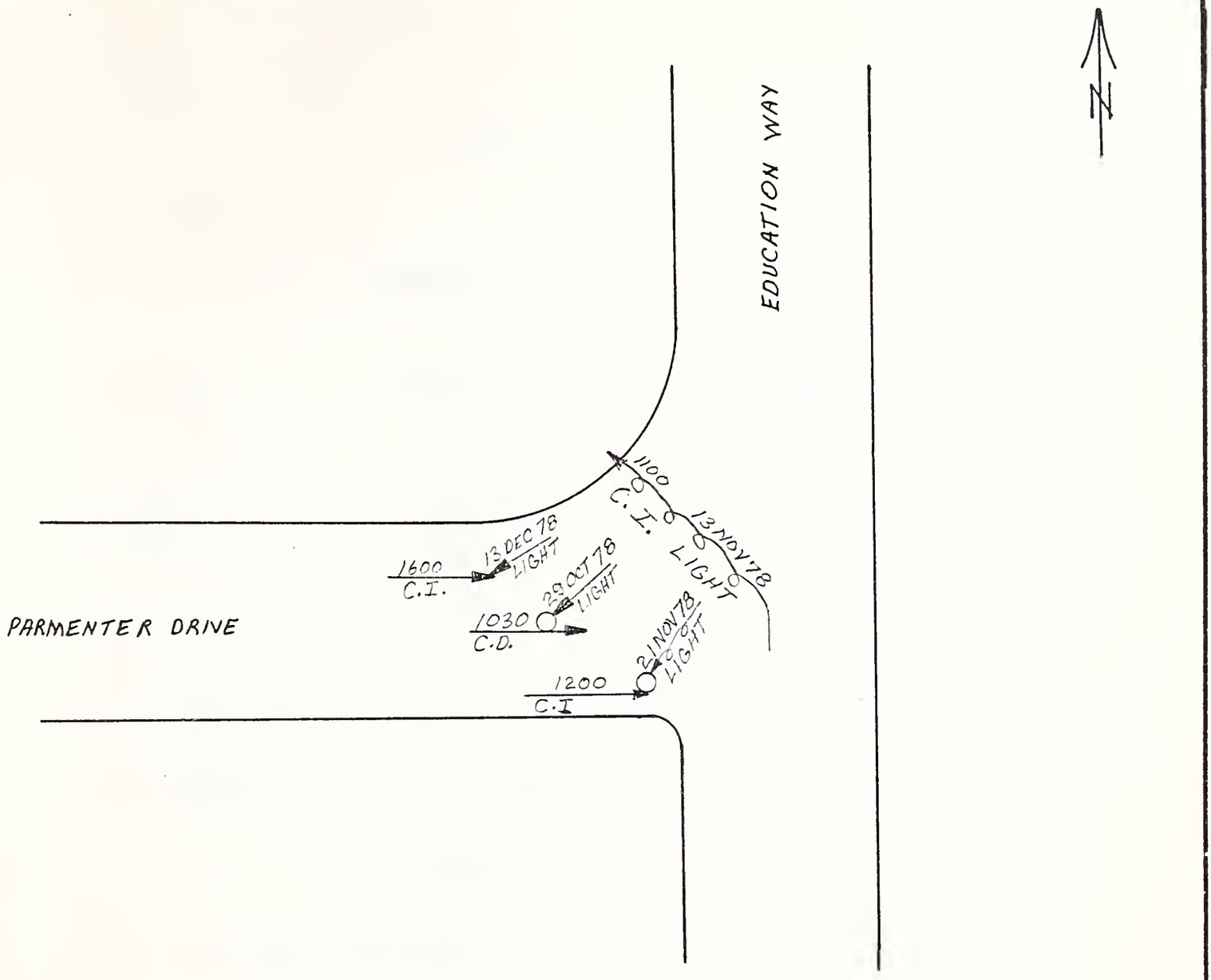
0	1	2	3	4	5	6
2	1	1				

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
4						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
2						1	1	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 — DATE 08 AUG. 79

R. W. — DARK

WEATHER — LIGHT

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION *Int. Parmenter Drive and Education Way* SITE 1

PERIOD *5 Years* FROM *1976* TO *1980*

PREPARED BY *B. PETERSON* DATE *SEPT. 1981*

DETERMINATION OF HAZARD INDEX

Site Number 1 Date September 1981

Site Description Intersection of Education Way and Parmenter Drive

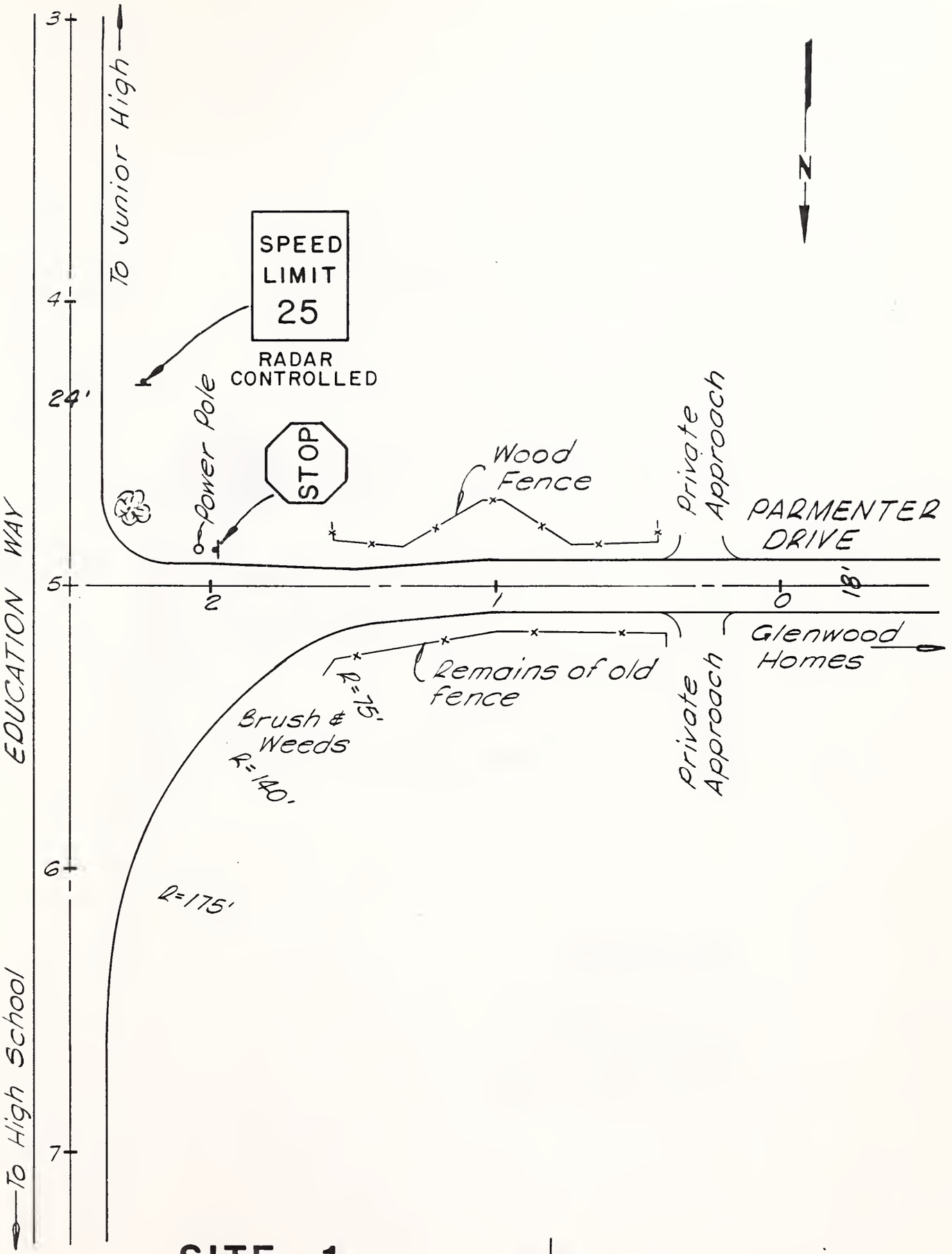
Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.8 acc/yr	23	x 0.164 =	3.77
Accident Rate	0.94 acc/MEV	17	x 0.225 =	3.83
Accident Severity	4525 dollars	46	x 0.191 =	8.79
Volume/Capacity Ratio	0.40	59	x 0.082 =	4.84
Sight Distance Ratio	(wt.avg)	0	x 0.074 =	0
Driver Expectancy	2.3 (wt.avg)	38	x 0.149 =	5.66
Info. System Deficiencies	3.7 (wt.avg)	62	x 0.115 =	7.13
		Hazard Index:		34.01

Cost of Short Term Improvements $1150

Cost Factor - 98.3

Priority Index = 34.01 X 0.75 + 98.3 X 0.25 = 50.1

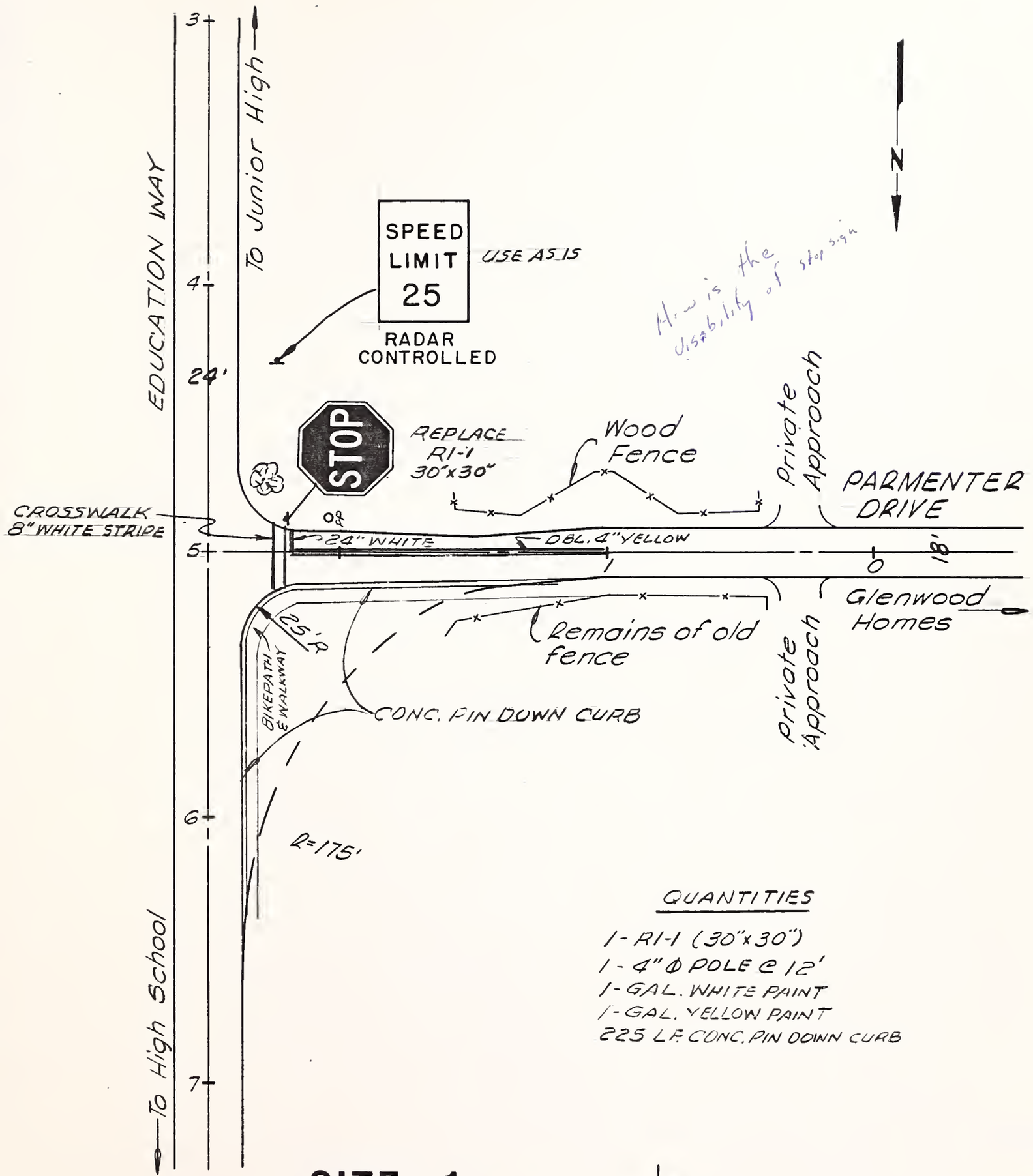
RPT28/FF



SITE 1

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1 - R1-1 (30"x30")
1 - 4" Ø POLE @ 12'
1 - GAL. WHITE PAINT
1 - GAL. YELLOW PAINT
225 L.F. CONC. PIN DOWN CURB

SITE 1

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 2

SITE NUMBER 2 - RIVER ROAD, EAST

LOCATION

Site Number 2 includes two reverse curves on the River Road approximately 1.8 miles from State Highway 37. The River Road follows the Kootenai River for several miles and serves residences, farms and ranches in this area.

EXISTING CONDITIONS

The roadway, in the area of Site 2 is generally 24 feet wide and has an asphalt surface. Vertical grades are uniform and less than 1%. Degree of curvature is 10° on the eastern curve and 5°30' on the western curve. The roadway has double solid yellow centerline stripes with no shoulder striping. There is a standard SPEED LIMIT 35 sign located just west of the site. ADT was determined to be 1110 vehicles per day by a 24 hour machine count on 30 through 31 July 1981. The truck traffic is estimated to be 10%. The posted speed on the River Road is 45 MPH. The sight distance approaching the curve is greater than 1000 ft from the west and approximately 700 feet, twice the recommended safe stopping sight distance from the east. Sight distance around the curves is as short as 225 feet. Superelevation varies from 0.02 ft/ft near the center of the west curve to a negative superelevation near the ends of both curves. The curves were traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve should be traveled was determined to be 35 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

There were five reported accidents in the five year period from 1976 to 1980. Most of the accidents involved vehicles leaving the road apparently because of an inability to negotiate the curves. Four of the five accidents occurred on icy or wet surfaces and four of the five accidents occurred during the daylight hours.

The type and character of the accidents suggest that more adequate advance warning of the curves is needed.

SHORT TERM IMPROVEMENTS

Advance curve warning signs, some with advisory speed plates, are recommended. Because of the short sight distance around the curves, the existing double yellow centerline striping is very important in this area and should be maintained and repainted when necessary to provide a bright, clear lane division. The estimated cost of short term improvements is $1,075.00.

LONG TERM IMPROVEMENTS

The safety and comfort of the curves can be improved significantly, especially during wet or icy conditions, by constructing adequate superelevation. The recommended superelevation rate, because of the snow and ice conditions that are common in the area, is 0.08 ft. per ft. The recommended runoff length, the distance along the roadway required to go from a normal crown to full superelevation at the beginning of the curve is 180 feet, based on a design speed of 45 MPH.

No long term improvements are recommended at this time. Reconstruction of the curves should probably come after the existing pavement has deteriorated and requires reconstruction.

With the proper superelevation, the safe speed will rise above the 35 miles per hour indicated by the ball-bank indicator.

ACCIDENT DATA

SITE NUMBER 2 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
2	1		1	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
1					1	3

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
	1								1	1	2

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
1	1		3	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
3	2			

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
4	1		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES	1	1		1	
FATALITIES					
P. D. O.	1				1

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

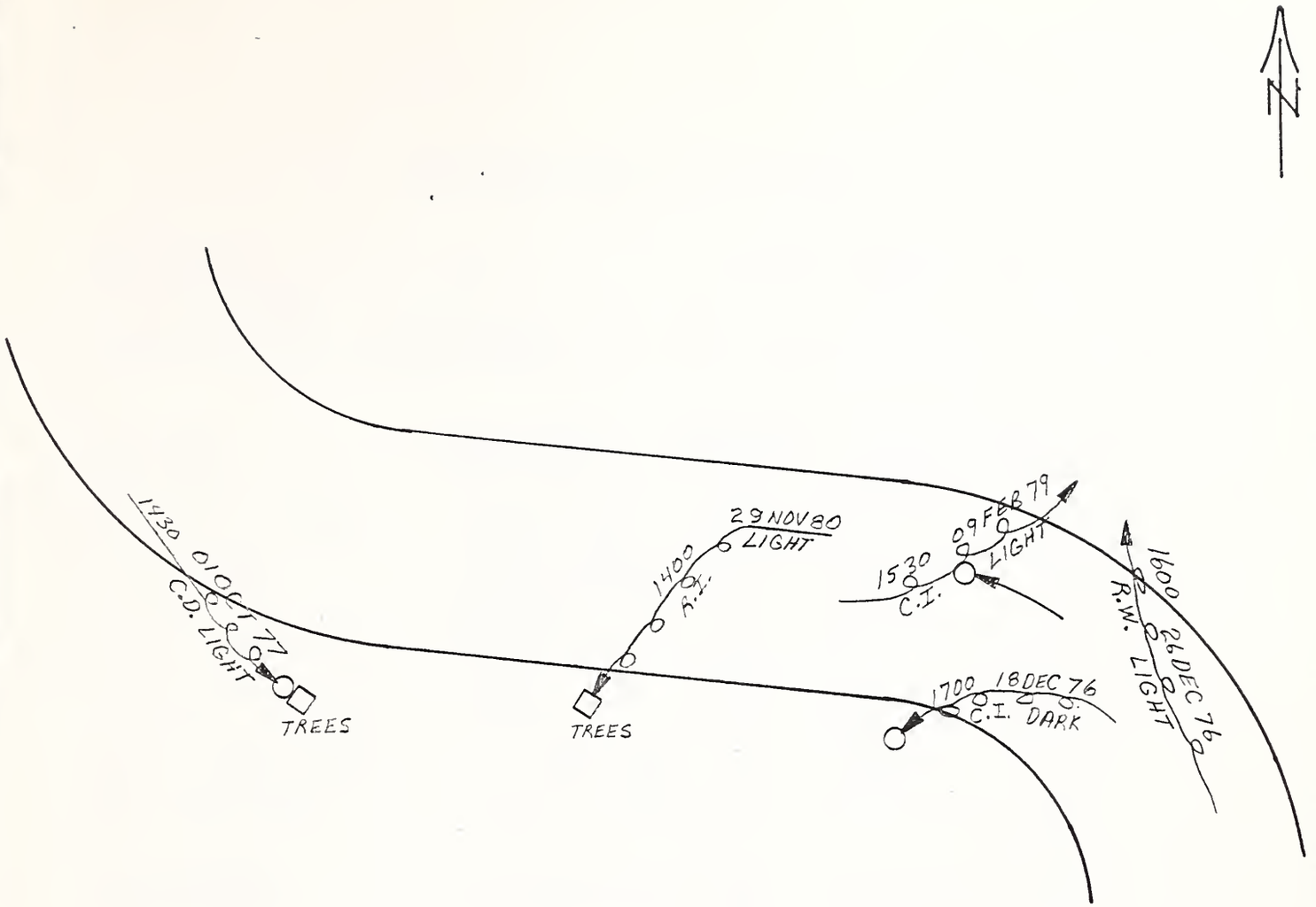
0	1	2	3	4	5	6
2	2		1			

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
5						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
			2			1	2	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 DATE 08 AUG. 79

WEATHER R.W. LIGHT DARK

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION RIVER ROAD NW¼ NW¼ 33-31-31 SITE 2

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 2 Date September 1981

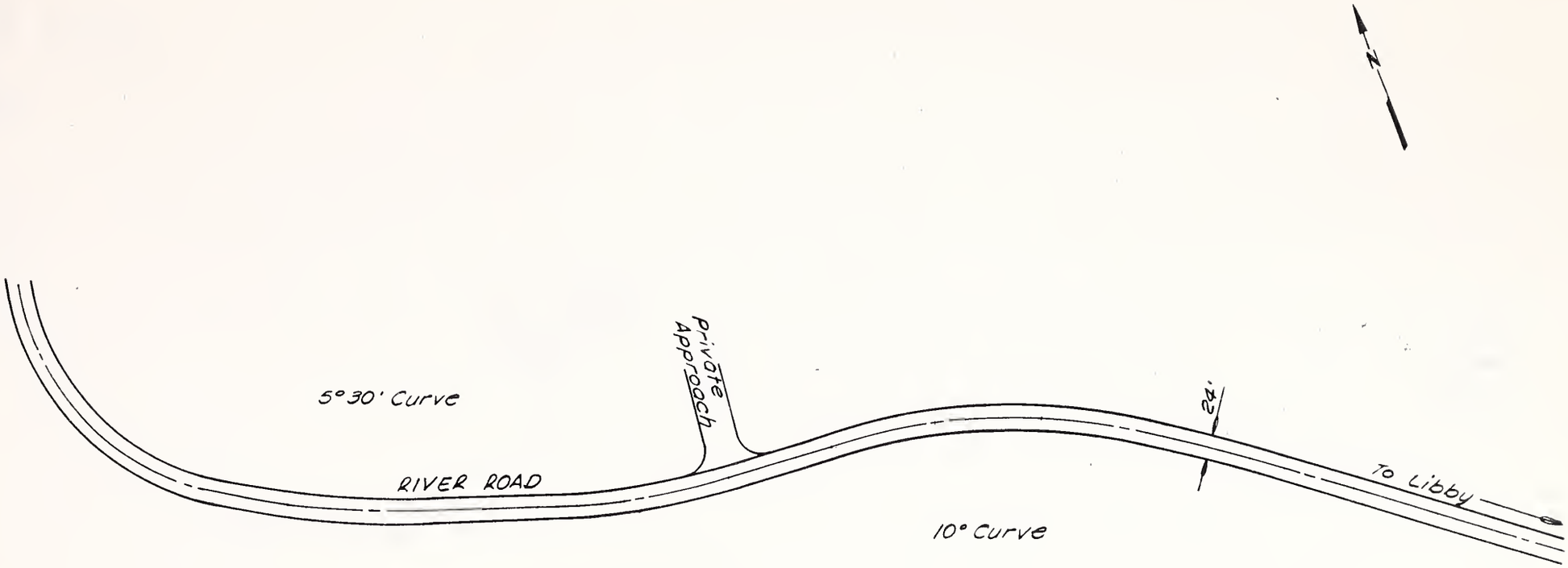
Site Description River Road

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	1.0 acc/yr	27	x 0.164 =	4.43
Accident Rate	2.5 acc/MEV	40	x 0.225 =	9.00
Accident Severity	13460 dollars	72	x 0.191 =	13.75
Volume/Capacity Ratio	0.18	36	x 0.082 =	2.95
Sight Distance Ratio	(wt.avg)	0	x 0.074 =	0
Driver Expectancy	1.0 (wt.avg)	17	x 0.149 =	2.53
Info. System Deficiencies	3.7 (wt.avg)	62	x 0.115 =	7.13
	Hazard Index:			39.8

Cost of Short Term Improvements $1075

Cost Factor - 97.2

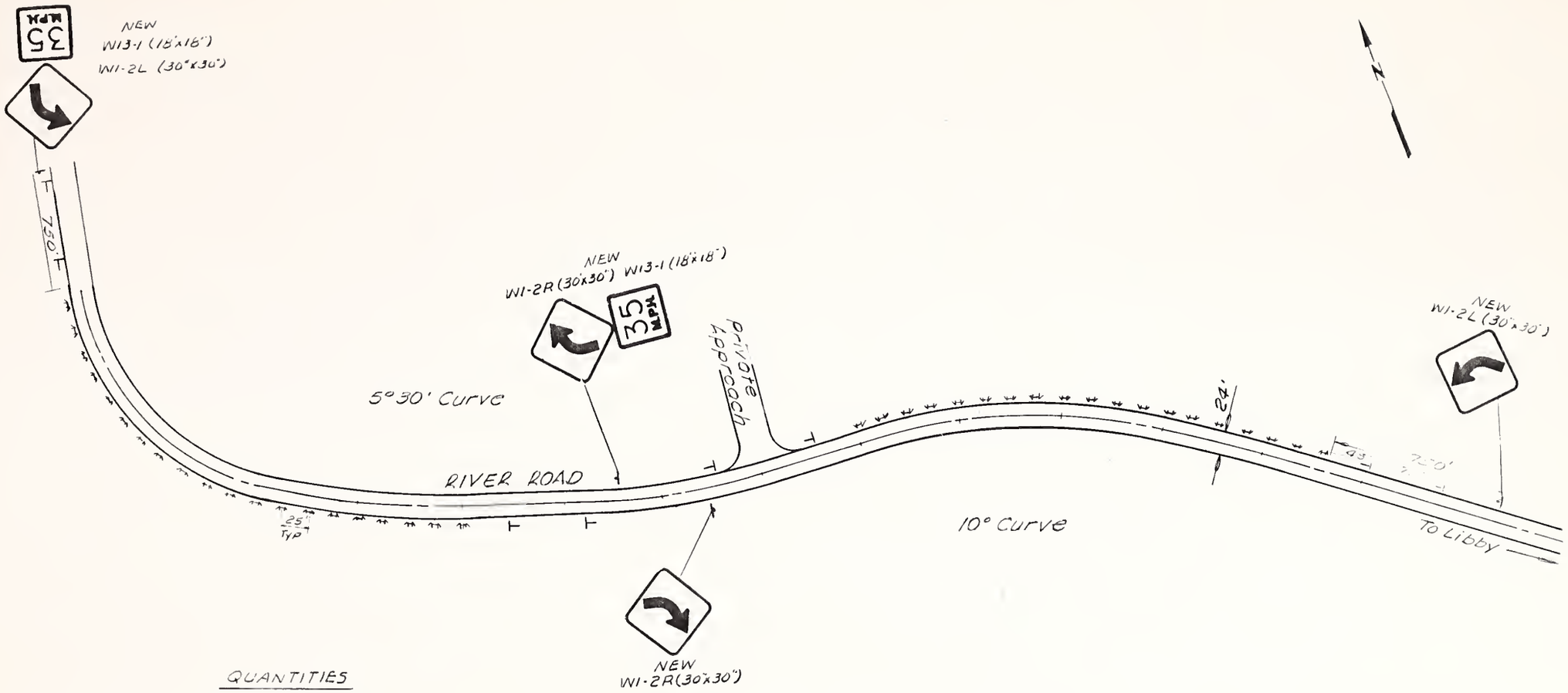
Priority Index = 39.8 X 0.75 + 97.2 X 0.25 = 54.2



SITE 2

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

2 - W1-2L (30"x30")
2 - W1-2R (30"x30")
2 - W13-1 (18"x18" - 35MPH)
2 - 4"Ø POLE @ 14'
2 - 4"Ø POLE @ 12'
8 - DESIGN "A" DELINEATOR
39 - DESIGN "C" DELINEATOR
47 - METAL U DELIN. POST @ 6'

SITE 2

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 3

SITE NUMBER 3 - MEADOW CREEK ROAD

LOCATION

Site Number 3 includes a 28° curve on the Meadow Creek Road approximately 1.7 miles west of Fortine. The road follows Meadow Creek for several miles and serves residences, farms and ranches in the area.

EXISTING CONDITIONS

The roadway, in the area of Site 3, is generally 20 feet wide and has an asphalt surface. Vertical grades are uniform and less than 3%. The roadway has a faded white, dashed centerline stripe except around the curve where there is no striping. There is no signing at or near the site. ADT was determined to be 180 vehicles per day by a 24 hour machine count on 28 through 29 July 1981. The truck traffic is estimated to be 10%. The posted speed on the Meadow Creek Road is 45 MPH. The sight distance approaching the curve is greater than 1000 ft from the west and approximately 350 feet from the east, equal to the recommended safe stopping sight distance. Sight distance around the curve is as short as 180 feet. Superelevation varies from 0.06 ft/ft near the center of the west curve to 0.02 ft/ft near the ends of both curves.

The curve was traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve can be traveled was determined to be 30 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

There was only one reported accident on the curve in the five year period from 1976 to 1980. The accident involved a vehicle leaving the road apparently because of an inability to negotiate the curve. The accident included one fatality and six injuries and occurred at night on a dry roadway.

The type and character of the accident suggests that more adequate advance warning of the curve is needed.

SHORT TERM IMPROVEMENTS

Advance curve warning signs with advisory speed plates, are recommended. Delineations should be installed along the outside edge of the curve to emphasize the severity of the curve to approaching drivers. Because of the short sight distance around the curve, double yellow centerline striping is very important in this area and should be installed, maintained and repainted when necessary to provide a bright, clear lane division. The estimated cost of short term improvements is $550.00. Short term improvements should also include brush and weed removal to improve site distance around the curve.

LONG TERM IMPROVEMENTS

The safety and comfort of the curve can be improved significantly, especially during wet or icy conditions, by constructing adequate superelevation. The recommended superelevation rate, because of the snow and ice conditions that are common in the area, is 0.08 feet per foot. The recommended runoff lengths, the distance along the roadway required to go from a normal crown to full superelevation, is 180 feet, based on a design speed of 45 MPH.

No long term improvements are recommended at this time. After the existing pavement has deteriorated and requires reconstruction, the curve should be reconstructed with the proper superelevation and runoff based on an engineered design and construction staking.

With the proper superelvation, the safe speed will rise above the 30 miles per hour indicated by the ball-bank indicator.

ACCIDENT DATA

SITE NUMBER 3 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
			1	

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
					1	

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
			1								

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
1				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
1				

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
	1		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES					
FATALITIES				1	
P. D. O.					

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

0	1	2	3	4	5	6
						1

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
	1					

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
							1	

SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 DATE 08 AUG. 79

R.W. DARK

WEATHER LIGHT

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION MEADOW CREEK ROAD 3 MILES WEST OF FORTINE SITE 3

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 3 Date September 1981

Site Description Meadow Creek Road

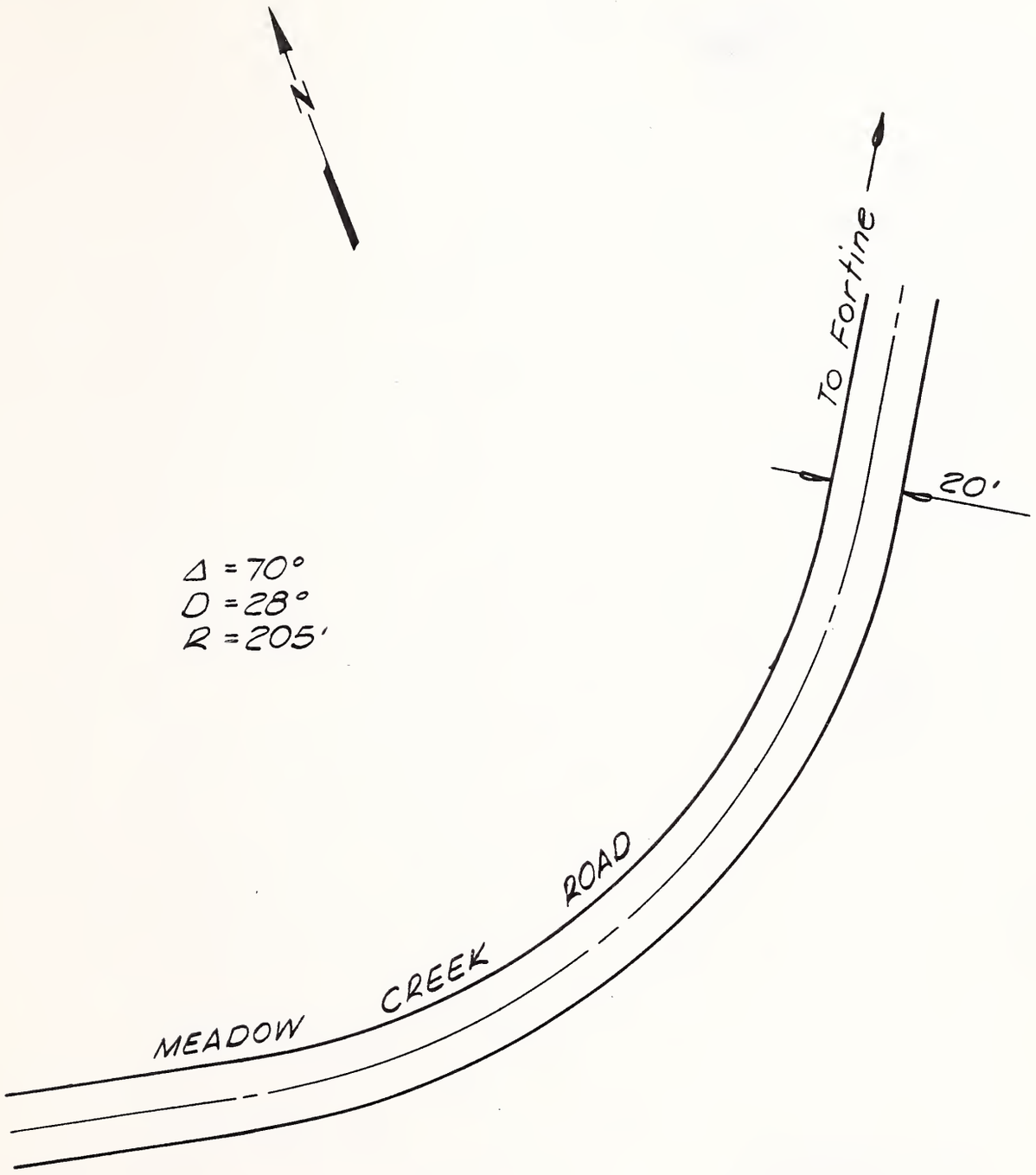
Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.2 acc/yr	12	x 0.164 =	1.97
Accident Rate	3.0 acc/MEV	46	x 0.225 =	10.35
Accident Severity	12400 dollars	70	x 0.191 =	13.37
Volume/Capacity Ratio	0.06	20	x 0.082 =	1.64
Sight Distance Ratio	(wt.avg)	22	x 0.074 =	1.63
Driver Expectancy	3.0 (wt.avg)	50	x 0.149 =	7.45
Info. System Deficiencies	6.0 (wt.avg)	100	x 0.115 =	11.50
	Hazard Index:			47.91

Cost of Short Term Improvements $550

Cost Factor - 90.4

Priority Index = 47.91 X 0.75 + 90.4 X 0.25 = 58.4

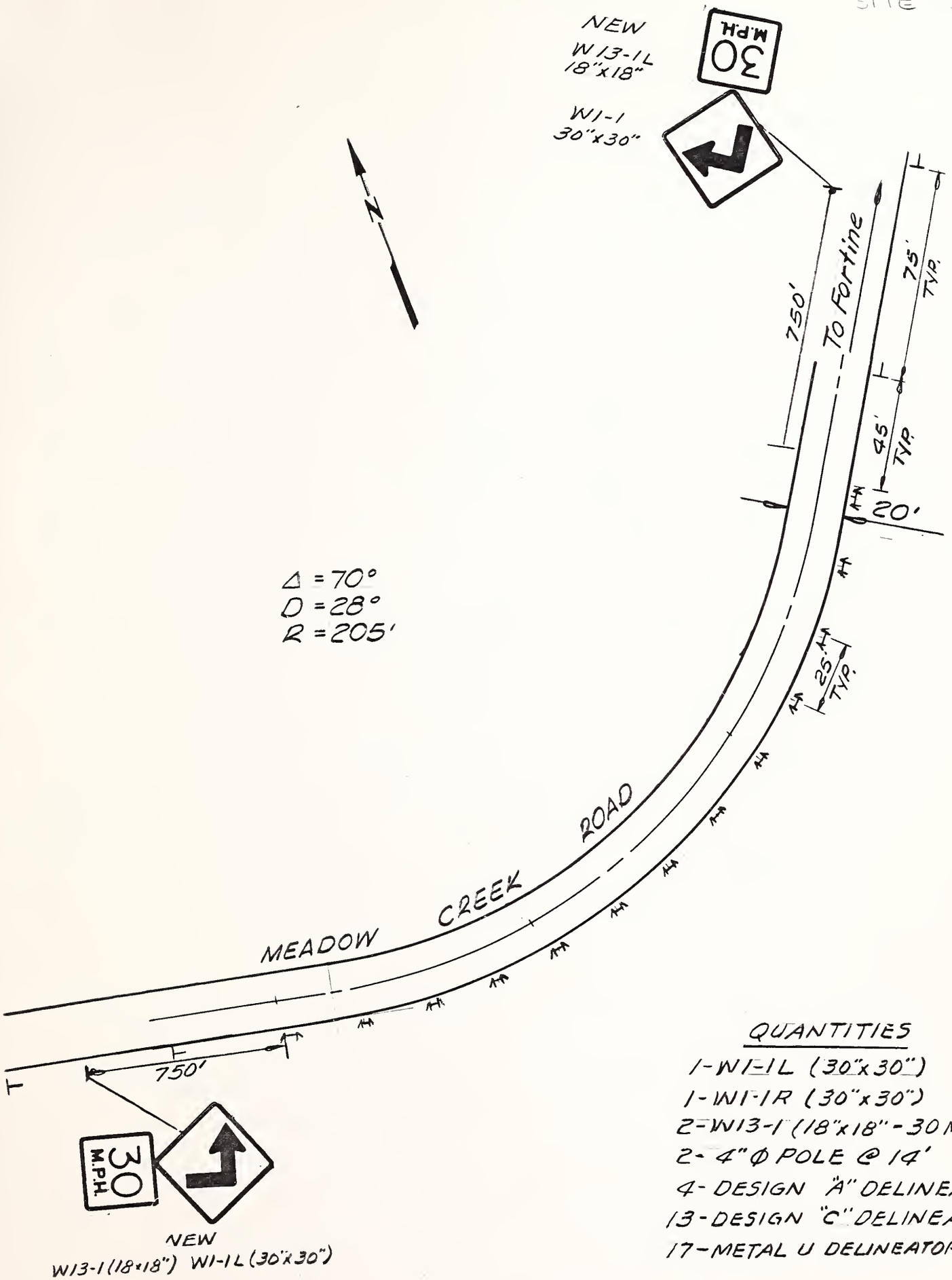
RPT28/FF



SITE 3

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1-W1-1L (30"x30")
1-W1-1R (30"x30")
2-W13-1 (18"x18" - 30 MPH)
2-4"Ø POLE @ 14'
4-DESIGN "A" DELINEATOR
13-DESIGN "C" DELINEATOR
17-METAL U DELINEATOR POST @ 6'

SITE 3

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 4

SITE 4 - PINKHAM CREEK ROAD

LOCATION

Site 4 includes a sharp curve approximately 1.8 miles from Eureka on the Pinkham Creek Road. The road serves residences and recreational interests in the area. The Pinkham Creek Road goes to Baker and Otharp Lakes and provides access to other lakes in the area.

EXISTING CONDITIONS

The roadway, at Site 4 has a general width of 24 feet and has an asphalt pavement. The curve has a maximum degree of curvature of 80°. Grades vary to a maximum of approximately 2%. There is no sign at or near the site, but the roadway has a double yellow centerline stripe that has been recently repainted. There is no shoulder striping. The ADT was determined to be 440 vehicles per day by a machine count taken on 28 and 29 July 1981. The truck traffic is estimated to be 10%. The posted speed is 35 MPH. Superelevation should be adequate since it varies from 0.06 ft/ft to 0.08 ft/ft around the sharpest part of the curve.

The curve was traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve should be traveled was determined to be 15 miles per hour.

ACCIDENT HISTORY AND ANLAYSIS

There were no accidents recorded on the curve during the five year period from 1976 to 1980.

SHORT TERM IMPROVEMENTS

It is recommended that advance curve warning signs with 15 MPH advisory speed signs be installed in advance of each end of the curve to warn approaching drivers. In addition, large arrow signs should be placed at locations determined in the field by trial runs to clearly

indicate the points of severe curvature. The existing double yellow centerline stripe is very important around the curve and should be given a high priority in the county's maintenance and striping programs. The estimated cost of short term improvements is $975.00.

Short term improvements should also include brush and weed removal to improve site distance around the curve.

LONG TERM IMPROVEMENTS

As mentioned above, the superelevation is nearly adequate -- it is near the 0.08 ft/ft maximum recommended for areas where snow and ice is common. To widen the curve would require a very large amount of excavation and a large amount of additional right of way.

For the above reasons and because of the relatively low traffic volumes at the site, no major or long term improvements are recommended. When the existing pavement has served its useful life and is reconstructed, care should be taken to properly superelevate the curve in accordance with recommended standards.

DETERMINATION OF HAZARD INDEX

Site Number 4 Date September 1981

Site Description Pinkham Creek Road

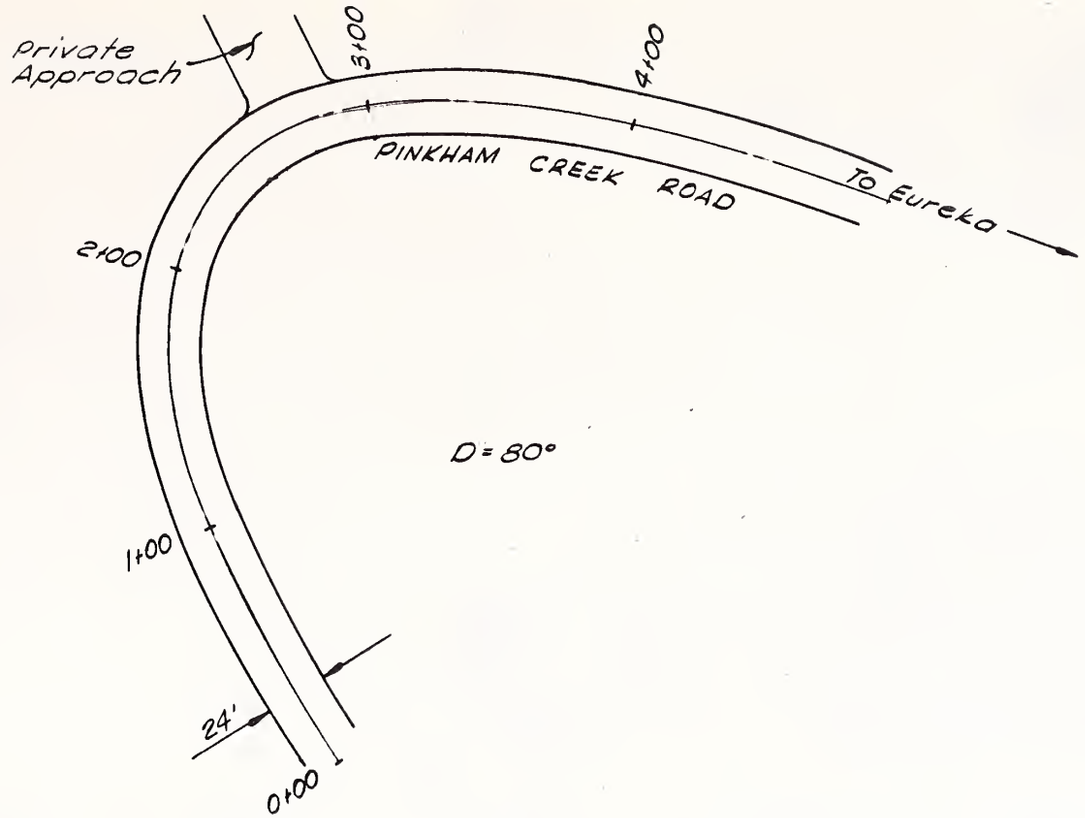
Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0 acc/yr	0	x 0.164 =	0
Accident Rate	0 acc/MEV	0	x 0.225 =	0
Accident Severity	0 dollars	0	x 0.191 =	0
Volume/Capacity Ratio	0.14	32	x 0.082 =	2.62
Sight Distance Ratio	(wt.avg)	15	x 0.074 =	1.11
Driver Expectancy	4.0 (wt.avg)	67	x 0.149 =	9.98
Info. System Deficiencies	6.0 (wt.avg)	100	x 0.115 =	11.50
	Hazard Index:			25.22

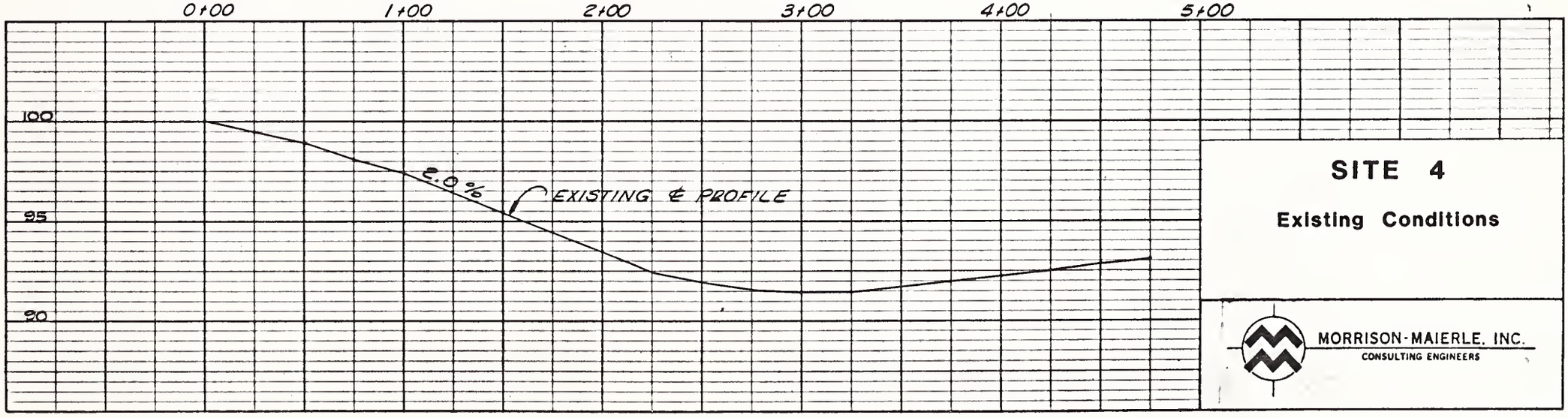
Cost of Short Term Improvements $975

Cost Factor - 93.3

Priority Index = 25.22 X 0.75 + 93.3 X 0.25 = 42.4

RPT28/FF

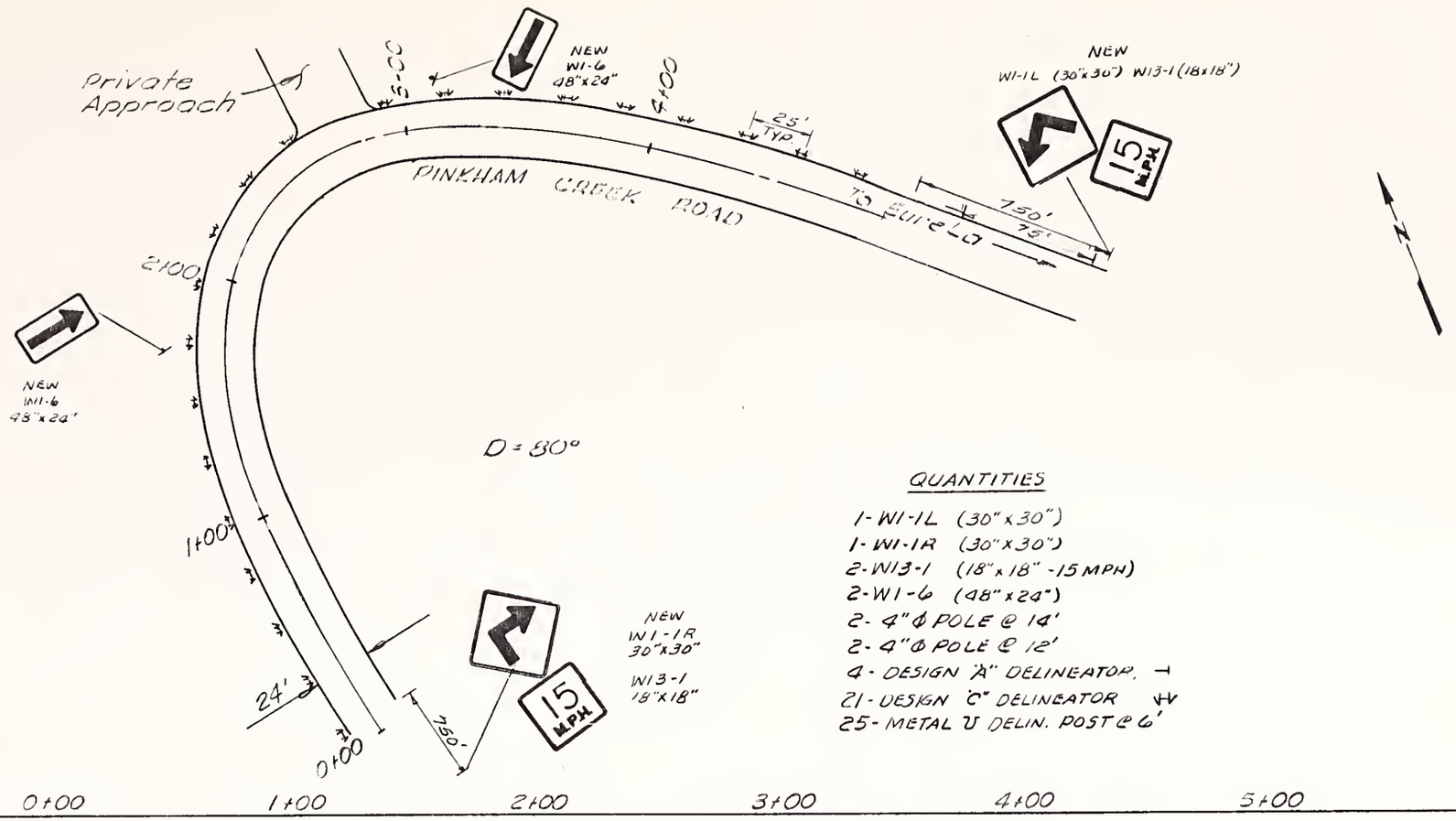




SITE 4

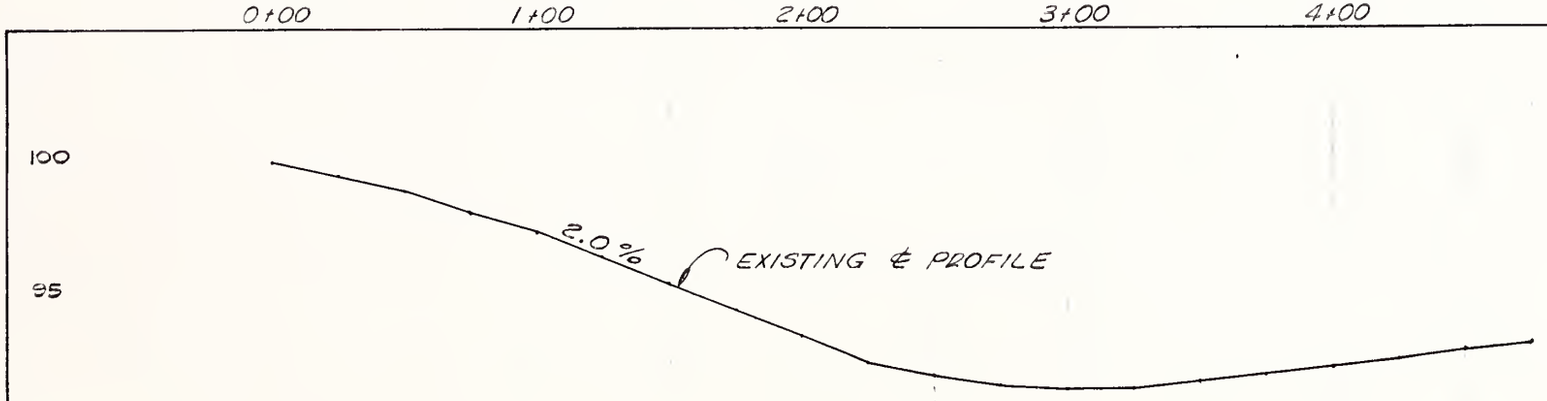
Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1 - W1-1L (30"x30")
1 - W1-1R (30"x30")
2 - W13-1 (18"x18" - 15 MPH)
2 - W1-6 (48"x24")
2 - 4"Φ POLE @ 14'
2 - 4"Φ POLE @ 12'
4 - DESIGN "A" DELINEATOR
21 - DESIGN "C" DELINEATOR
25 - METAL U DELIN. POST @ 6'



SITE 4

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 5

SITE 5 - PIPE CREEK ROAD, SOUTH

LOCATION

Site 5 is located at a curve on the Pipe Creek Road, approximately 0.4 miles south of the community of Pipe Creek. Doak Creek crosses the road within the site. The Pipe Creek Road goes from Libby to Yaak and serves a ski resort, other recreational interests, residences, farms and ranches. The road is also heavily used by logging trucks.

EXISTING CONDITIONS

The existing roadway is asphalt paved and has a general width of 20 feet. The horizontal alignment includes a curve with maximum degree of curvature of approximately 14. The vertical alignment varies to a maximum of 2.2%. The horizontal curve is at the end of a long straight section of road from the north. Curve warning signs are in place ahead of each end of the curve. There are no advisory speed signs. There is an existing SPEED LIMIT 55 sign just north of the curve. The roadway has a double yellow centerline stripe and has shoulder striping. The ADT was determined to be 650 vehicles per day by a 24 hour machine count on 31 July and 1 August 1981. The truck traffic is estimated to be 20%. Sight distance is greater than 1000 feet approaching the curve from the north and approximately 900 feet approaching the curve from the southeast. The posted speed is 55 miles per hour. Superelevation varies from 0.06 ft/ft near the center of the curve to 0.03 ft/ft near one end of the curve. The curve was traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve should be traveled was determined to be 35 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

There were four accidents recorded during the five year period from 1976 to 1980. All four accidents occurred during wet or icy conditions and three of the four accidents occurred during rainy or snowy weather. The fourth accident occurred at night. All four accidents involved the inability to safely negotiate the curve. The accident history suggests, therefore,

that 1) curve visibility and advance warning and 2) improper superelvation for the degree of curvature are the cause of the accidents.

SHORT TERM IMPROVEMENTS

The existing advance curve warning signs should be moved to approximately 750 feet from the curve. 35 MPH advisory speed signs should be added below the curve signs. To further indicate the location of the curve and to provide additional visibility during periods of reduced visibility or at night, delineators are recommended along the outside edge of the curve. The existing double yellow centerline stripe is very important around the curve and should be given a high priority in the county's maintenance and striping programs. The estimated cost of short term improvements is $475.00.

LONG TERM IMPROVEMENTS

No long term improvements are recommended except that when the existing pavement has served it's useful life and is reconstructed, the roadway should be constructed with proper superelevation and superelevation runoff based on an engineered design and construction staking.

ACCIDENT DATA

SITE NUMBER 5 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
1	1	1		1

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
3			1			

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
2										2	

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
	1		3	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
1	1	2		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
2	2		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES	1				1
FATALITIES					
P. D. O.		1	1		

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

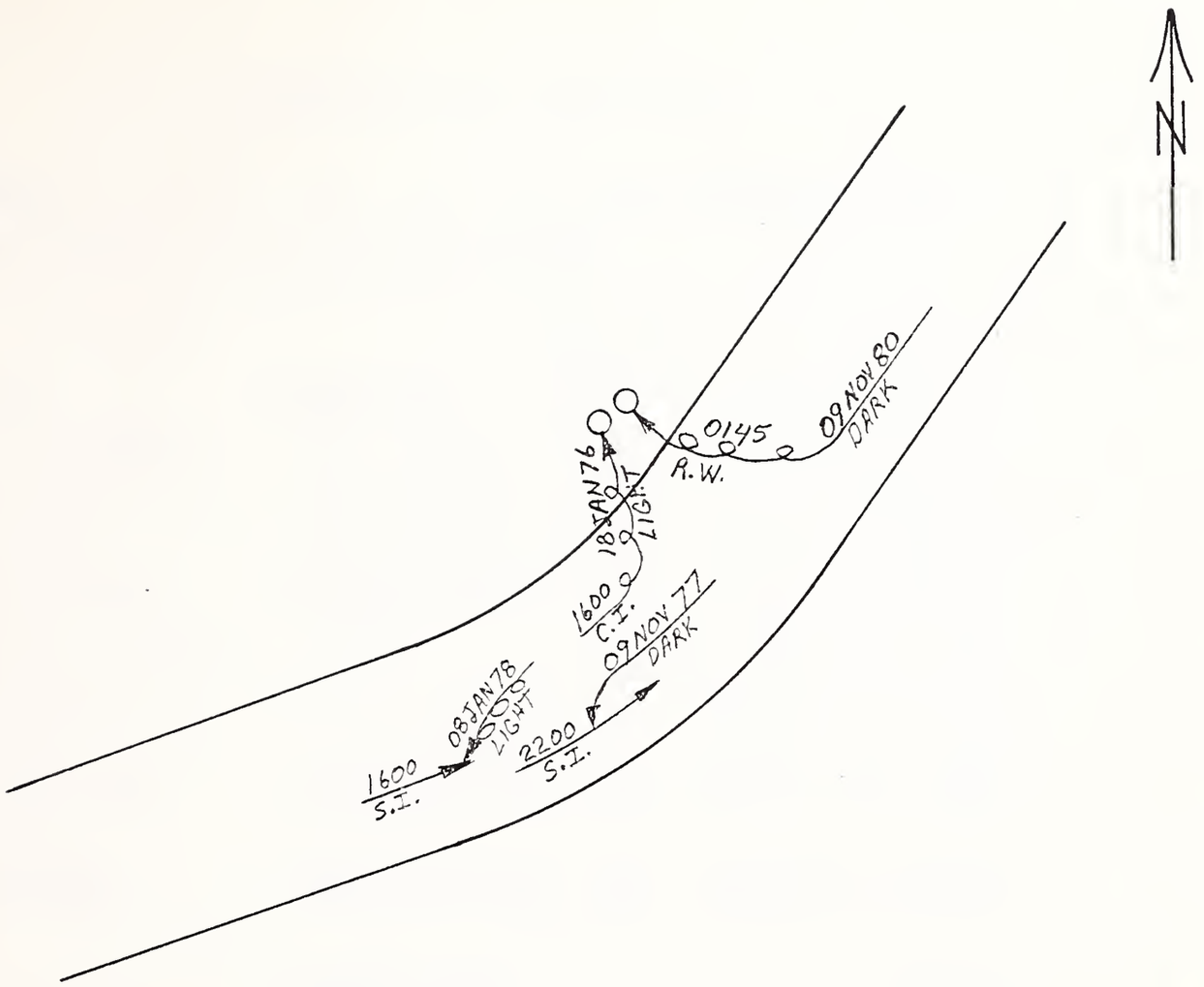
0	1	2	3	4	5	6
2	2					

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
4						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
						2	2	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 — DATE 08 AUG. 79

WEATHER R.W. — LIGHT DARK

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION PIPE CREEK ROAD SITE 5

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 5 Date September 1981

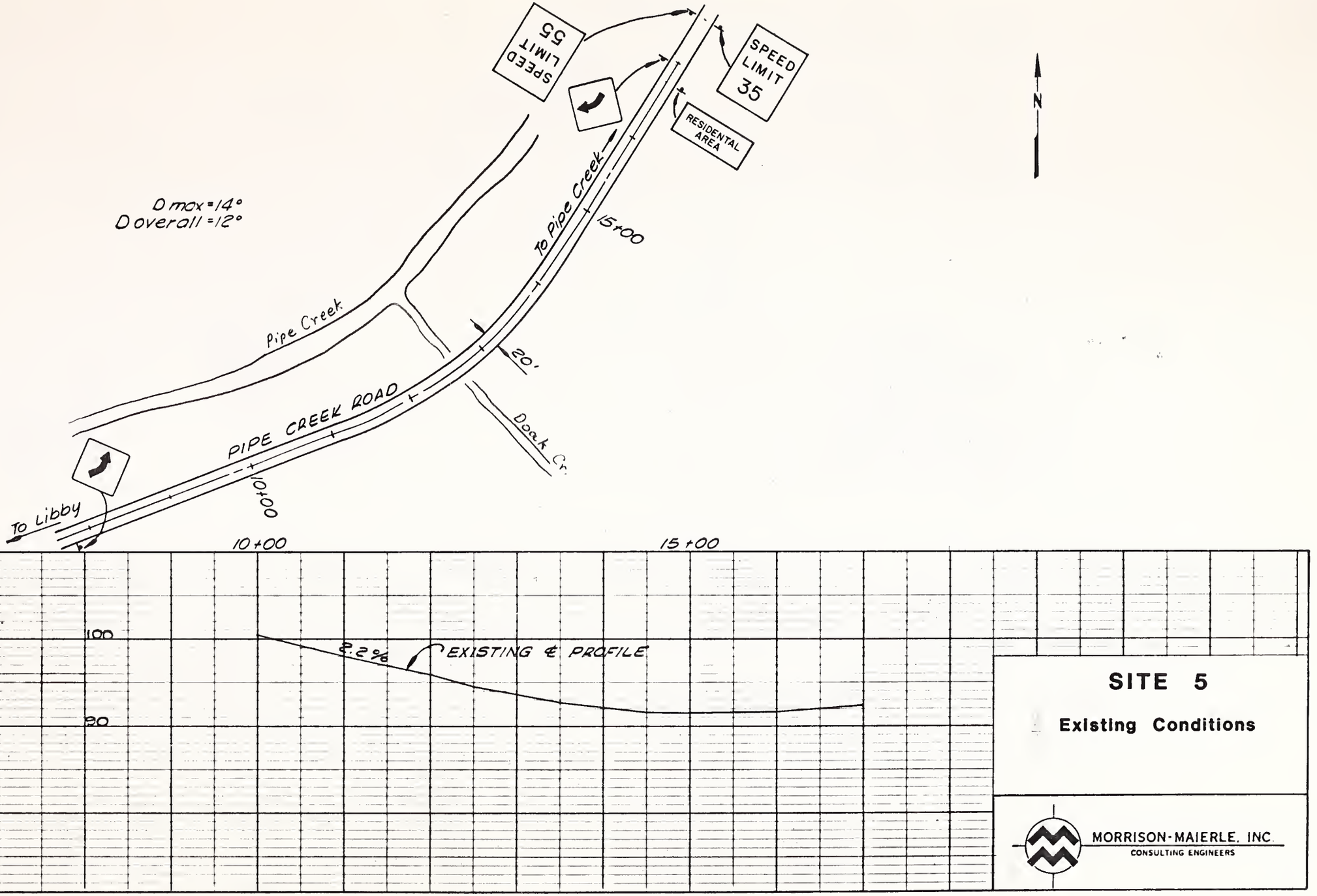
Site Description Pipe Creek Road, South

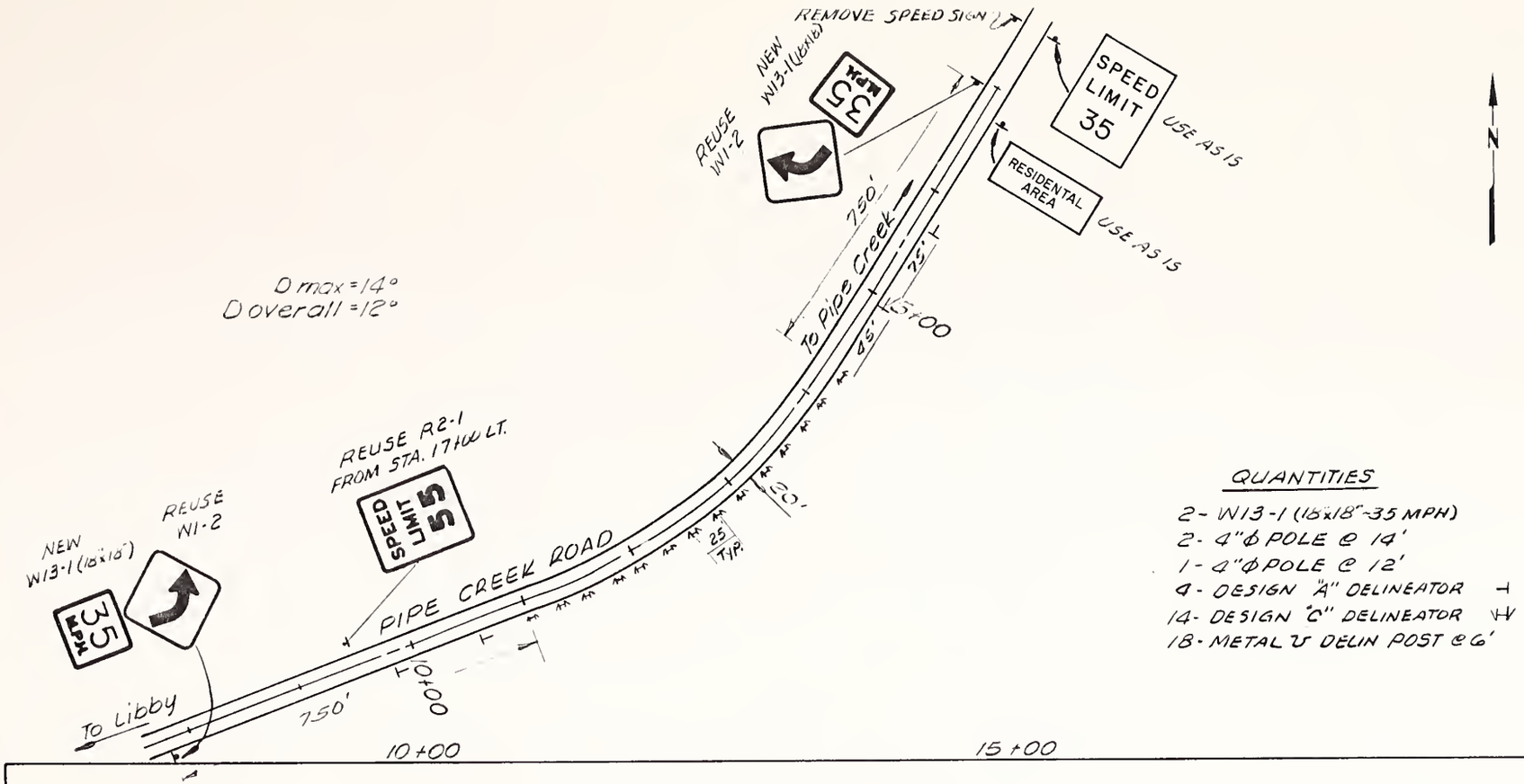
Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.8 acc/yr	23	x 0.164 =	3.77
Accident Rate	3.3 acc/MEV	49	x 0.225 =	11.03
Accident Severity	16,000 dollars	78	x 0.191 =	14.90
Volume/Capacity Ratio	0.27	43	x 0.082 =	3.53
Sight Distance Ratio	(wt.avg)	2	x 0.074 =	0.15
Driver Expectancy	4.0 (wt.avg)	67	x 0.149 =	9.98
Info. System Deficiencies	4.0 (wt.avg)	67	x 0.115 =	7.71
	Hazard Index:			51.06

Cost of Short Term Improvements $475

Cost Factor - 97.8

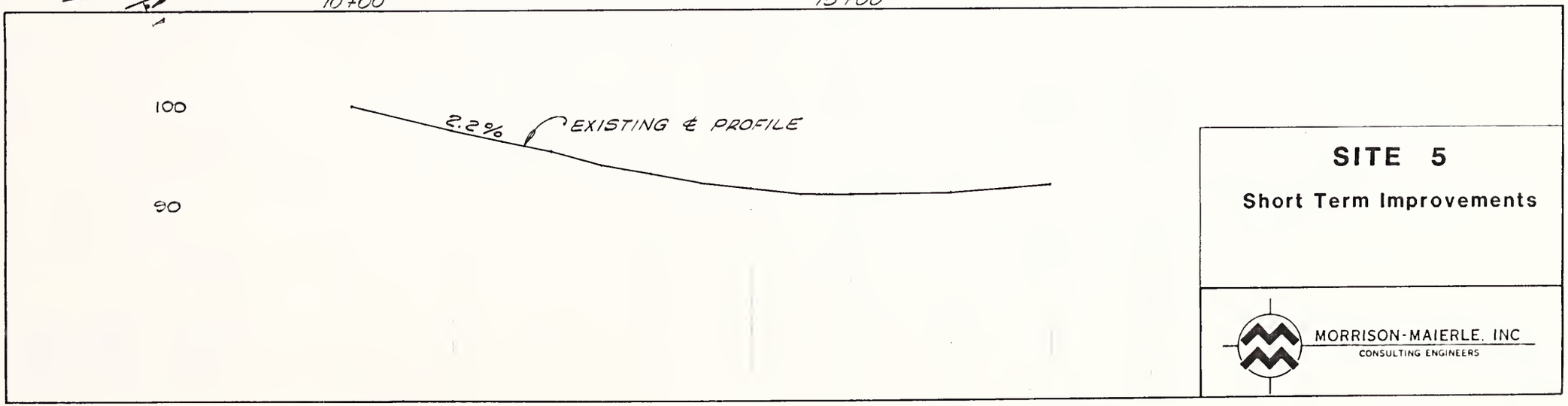
Priority Index = 51.06 X 0.75 + 97.8 X 0.25 = 62.7


SPEED LIMIT 55
SPEED LIMIT 35
RESIDENTAL AREA
N
D max = 14°
D overall = 12°
To Pipe Creek
15+00
Pipe Creek
20'
PIPE CREEK ROAD
Dodd Cr.
10+00
To Libby
10+00
15+00
100
90
8.2%
EXISTING ℄ PROFILE
SITE 5
Existing Conditions
MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

2 - W13-1 (18"x18" - 35 MPH)
2 - 4"ϕ POLE @ 14'
1 - 4"ϕ POLE @ 12'
4 - DESIGN "A" DELINEATOR
14 - DESIGN "C" DELINEATOR
18 - METAL U DELIN POST @ 6'



SITE 5

Short Term Improvements

MORRISON-MAIERLE, INC
CONSULTING ENGINEERS

SITE 6

SITE NUMBER 6 - PIPE CREEK ROAD, NORTH

LOCATION

Site 6 is a generally straight section of the Pipe Creek Road from approximately 3.2 miles south of the Tom Poole Lake Trail to approximately 1.0 miles north of the trail. The road serves mainly recreationists and logging trucks.

EXISTING CONDITIONS

The roadway at this site consists of a 24 foot wide asphalt pavement with a uniform, fairly flat grade with no vertical curves causing speed reduction or sight distance restrictions. There is no signing or striping through the area. The ADT was determined to be 162 vehicles per day by a 24 hour machine count on 31 July through 1 August 1981 and the truck traffic is estimated to be 20%. The posted speed is 55 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

Four accidents were recorded during the five year period from 1976 to 1980. Two of the accidents involved deer crossing the road during the morning hours. One of the accidents was caused by a vehicle traveling at a speed too fast for conditions. Only one accident involved icy or slick roads.

The accident history and the roadway conditions suggest that drivers may tend to travel faster and to be less alert on this long, easy driving section of road and they are not prepared for unexpected circumstances such as deer crossing the road.

SHORT TERM IMPROVEMENTS

Because of the existing roadway conditions and the accident history, it is recommended that additional SPEED LIMIT 55 signs be added and that DEER CROSSING signs be added to remind drivers of the safe speed for the road and to alert them of the hazard of deer crossing the road. The estimated cost of short term improvements is $550.00.

LONG TERM IMPROVEMENTS

There are no long term improvements recommended for this site.

ACCIDENT DATA

SITE NUMBER 6 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
2			1	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
	1	1	1		1	

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
						1				2	1

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
3			1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
3		1		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
1	3		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES	2				1
FATALITIES					
P. D. O.				1	

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

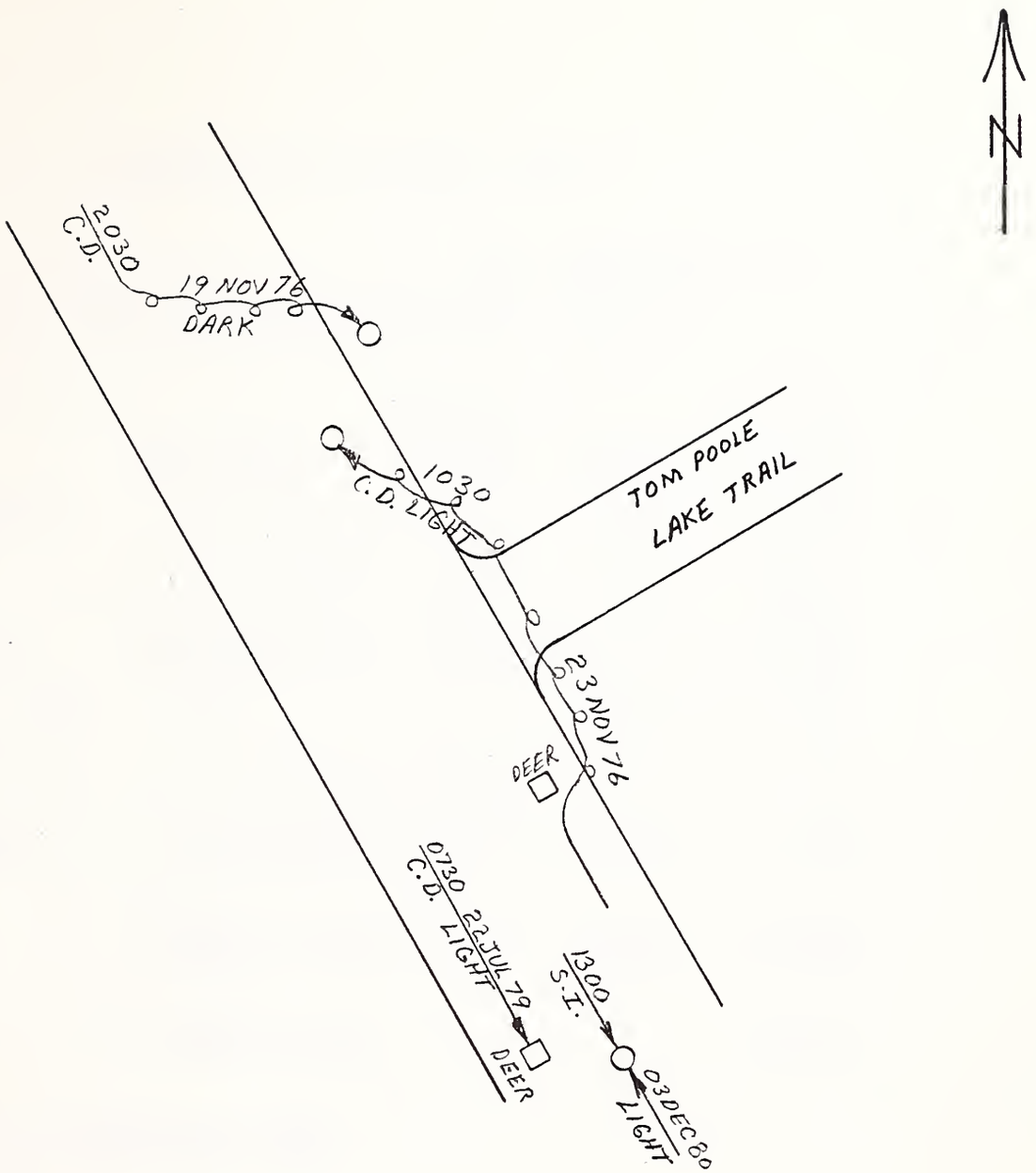
0	1	2	3	4	5	6
1	2	1				

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
4						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
					2		1	1



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 — DATE 08 AUG. 79

R.W. — DARK

WEATHER — LIGHT

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION PIPE CREEK ROAD AT TOM POOLE LAKE TRAIL SITE 6

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 6 Date September 1981

Site Description Pipe Creek Road at Tom Poole Lake Trail

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.8 acc/yr	23	x 0.164 =	3.77
Accident Rate	13.6 acc/MEV	100	x 0.225 =	22.50
Accident Severity	10,600 dollars	65	x 0.191 =	12.42
Volume/Capacity Ratio	0.1	7	x 0.082 =	0.57
Sight Distance Ratio	(wt.avg)	0	x 0.074 =	0
Driver Expectancy	0 (wt.avg)	0	x 0.149 =	0
Info. System Deficiencies	3.0 (wt.avg)	50	x 0.115 =	5.75
	Hazard Index:			45.01

Cost of Short Term Improvements $550

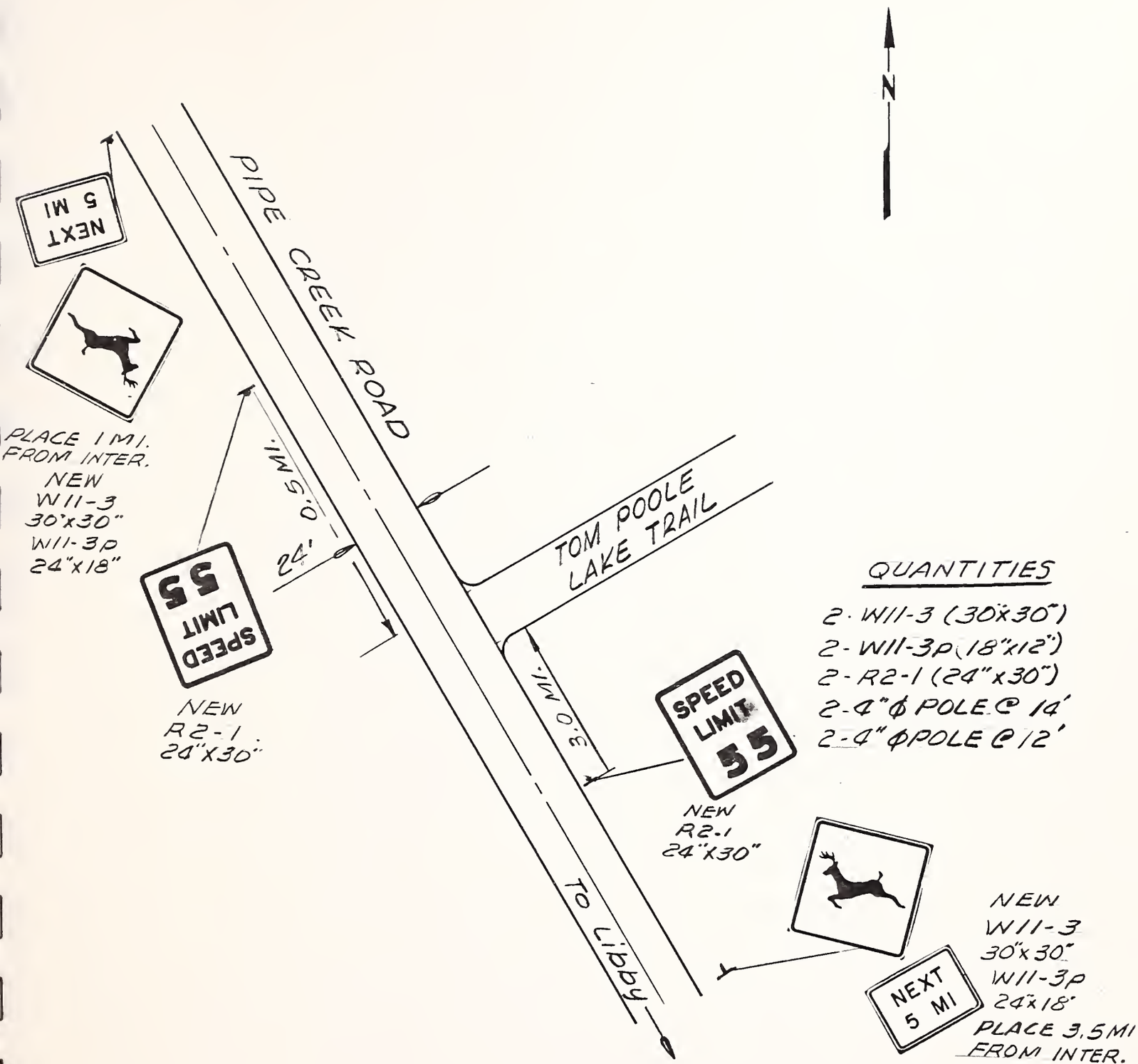
Cost Factor - 89.3

Priority Index = 45.01 X 0.75 + 89.3 X 0.25 = 56.1

SITE 6

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



SITE 6

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 7

SITE NUMBER 7 - INTERSECTON OF BOBTAIL CREEK ROAD AND PIPE CREEK CUT-OFF ROAD

LOCATION

Site 7 includes the intersection of the Bobtail Creek Road with the Pipe Creek Cut-Off Road. The Intersection is located approximately 2.5 miles west of the Community of Pipe Creek. Both roads serve residential, recreational and logging truck traffic.

EXISTING CONDITIONS

This site includes the T-intersection of 2 asphalt paved county roads. Both roads have pavement widths of 20 feet. Grades on both approach roads are less than 1%. There is no striping on either road. Intersection warning signs are in place and there is a yield sign on the Pipe Creek Cut-Off Road approach, the east approach. ADT, both directions, was determined to be 105 vehicles per day on the south leg, 90 vehicles per day on the north leg and 20 vehicles per day on the east leg by a 24 machine count on 31 July and 1 August 1981 and by turning movement counts on 2 September 1981. The truck traffic is estimated to be 20%. Sight distance is more than twice the recommended safe stopping sight distance from all approaches. Posted speed limit is 45 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

Only one accident was recorded at the intersection during the five year period from 1976 to 1980. The accident involved a single vehicle approaching from the east on a dry roadway at night. The driver apparently failed to see the intersection on time and slid across Bobtail Creek Road and into the borrow pit.

SHORT TERM IMPROVEMENTS

The approach from the Cutoff Road to the Bobtail Creek Road should be narrowed by removing the pavement and construction of borrow ditches, as

shown on the short term improvements sketch. This will assure traffic enters the road at only one point and will make the stop sign more visible. Signing should also be added as shown on the sketch. Radii shown are adequate for large trucks to turn at the approach. It is also recommended that a STOP AHEAD sign be installed ahead of the intersection. The estimated cost of short term improvements is $2,275.

LONG TERM IMPROVEMENTS

No long term improvements are recommended.

ACCIDENT DATA

SITE NUMBER 7 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
	1			

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
1						

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
				1							

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
1				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
1				

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
	1		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES		1			
FATALITIES					
P. D. O.					

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

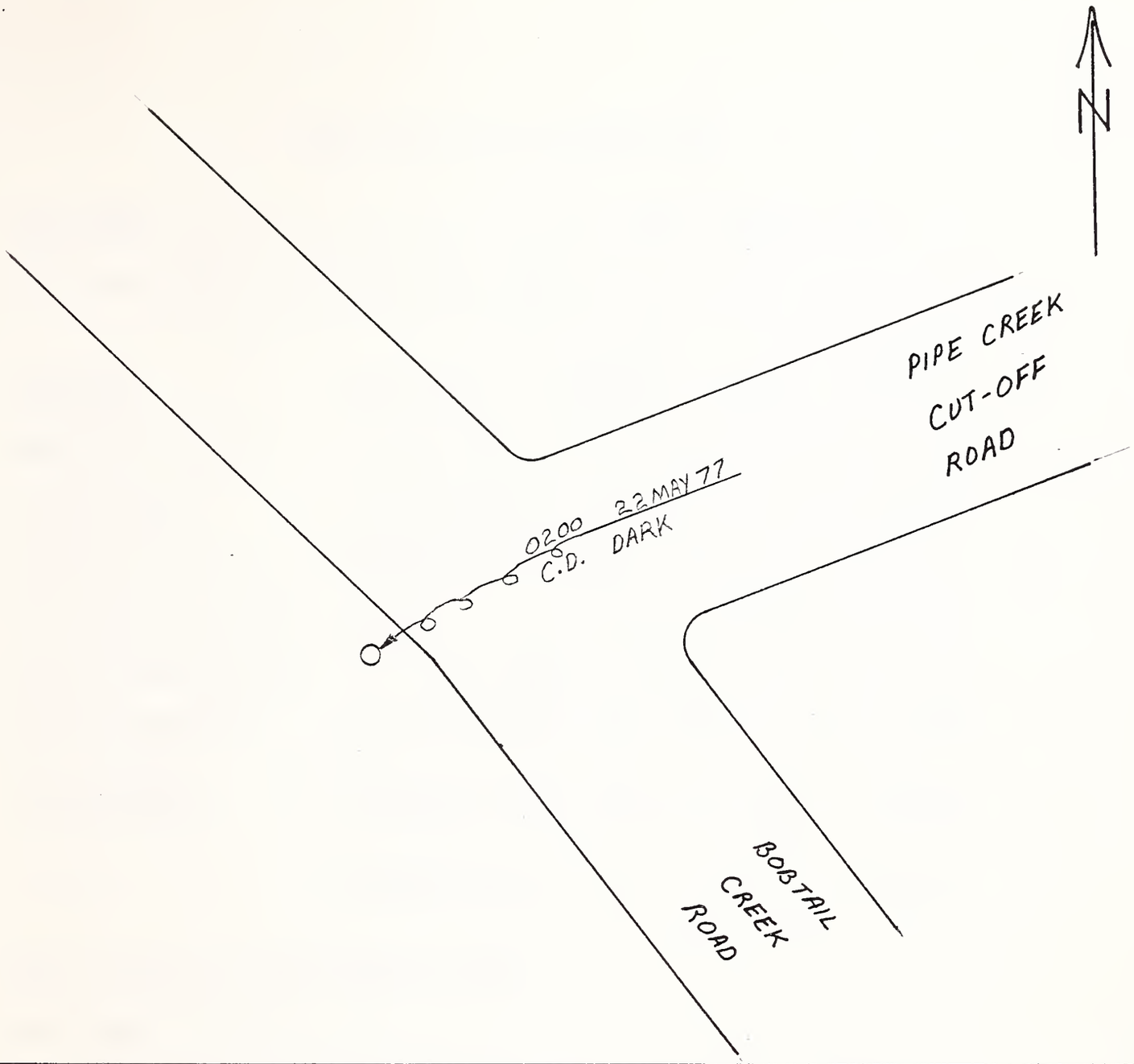
0	1	2	3	4	5	6
	1					

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
1						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
							1	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 DATE 08 AUG. 79

R. W. DARK

WEATHER LIGHT

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION INT. BOBTAIL CREEK RD. AND PIPE CR. CUT-OFF ROAD SITE 7

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 7 Date September 1981

Site Description Intersection Bobtail Cr. Rd. and Pipe Cr. Cutoff Rd.

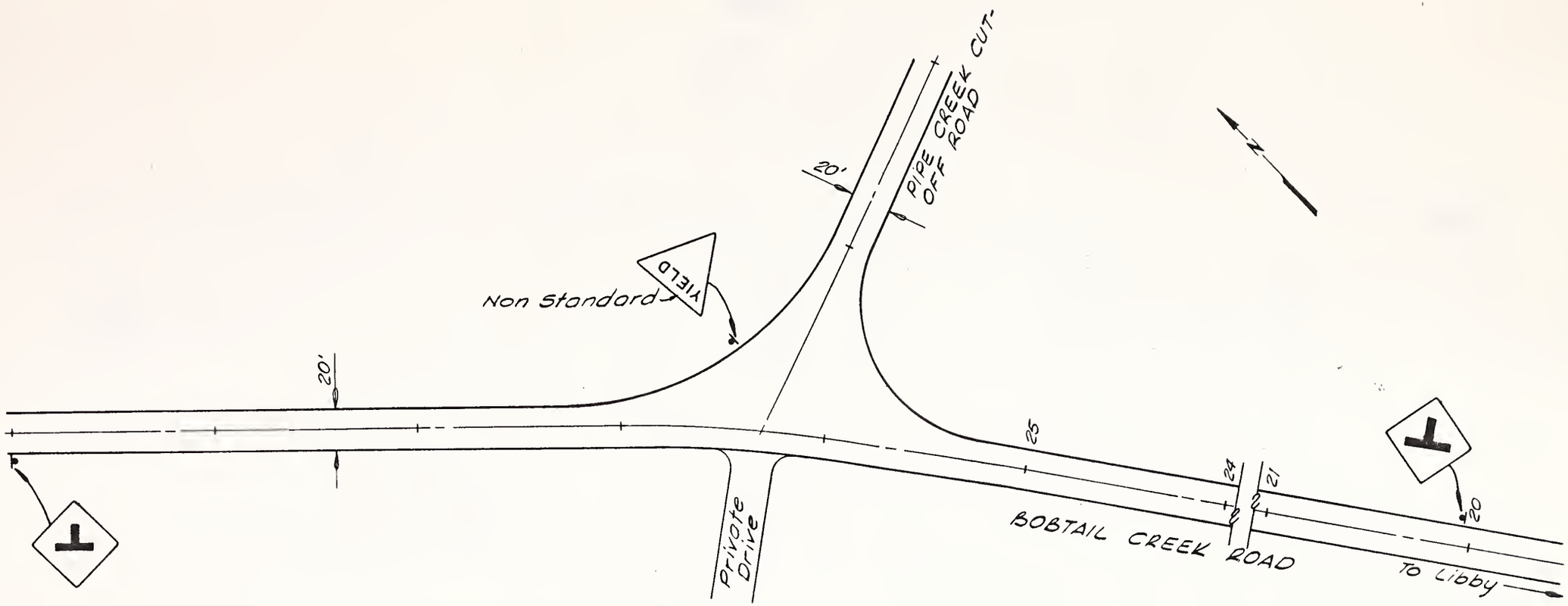
Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.2 acc/yr	12	x 0.164 =	1.97
Accident Rate	5.4 acc/MEV	70	x 0.225 =	15.75
Accident Severity	12,300 dollars	70	x 0.191 =	13.37
Volume/Capacity Ratio	0.04	16	x 0.082 =	1.31
Sight Distance Ratio	(wt.avg)	0	x 0.074 =	0
Driver Expectancy	3.0 (wt.avg)	50	x 0.149 =	7.45
Info. System Deficiencies	4.3 (wt.avg)	72	x 0.115 =	8.28
	Hazard Index:			48.13

Cost of Short Term Improvements $2275

Cost Factor - 30.8

Priority Index = 48.13 X 0.75 + 30.8 X 0.25 = 43.8

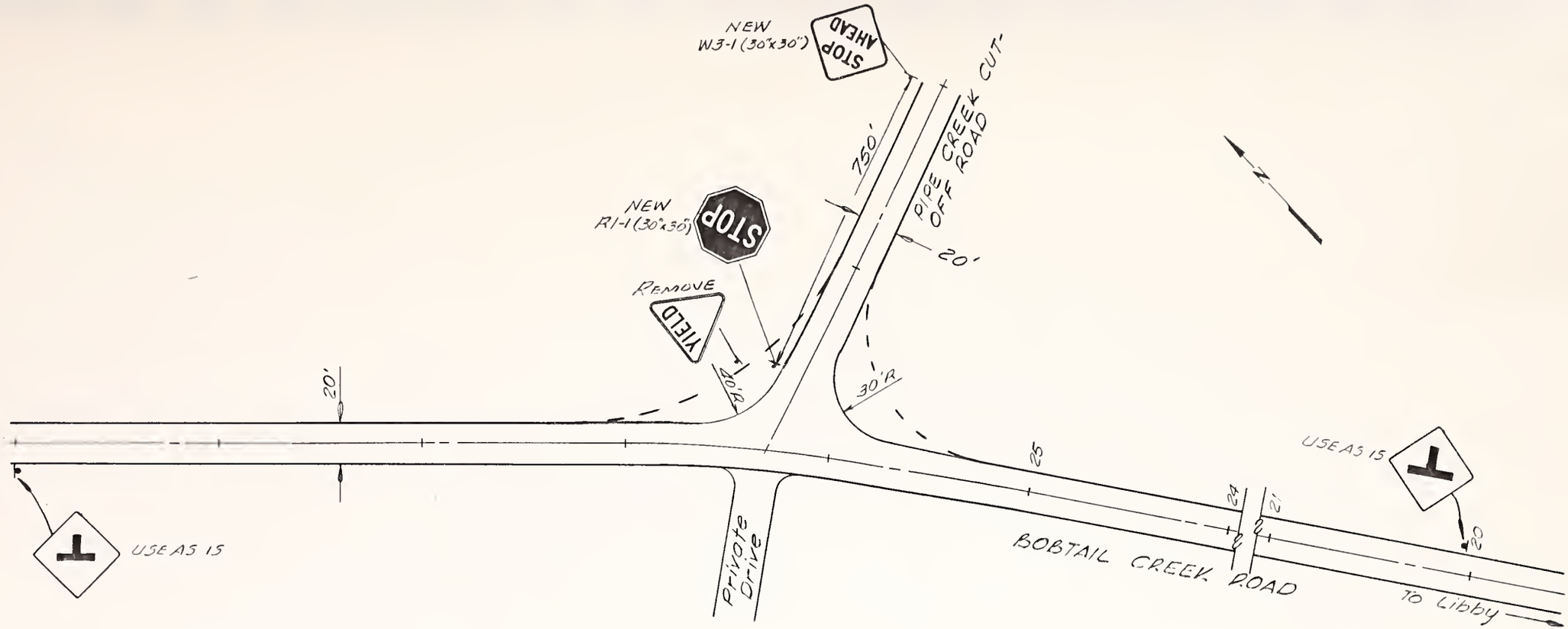
RPT28/FF



SITE 7

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1 - NEW W3-1 (30"x30")
1 - NEW R1-1 (30"x30")
2-4"Ø POLE @ 12'

SITE 7

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 8

SITE NUMBER 8 - RIVER ROAD, WEST

LOCATION

Site 8 includes a section of the River Road beginning at the St. Anthony Mine and running west for approximately 0.6 miles. The section includes two sharp curves immediately adjacent to the Kootenai River. The road serves farms, ranches, residences and recreational interests.

EXISTING CONDITIONS

The site includes an asphalt paved roadway generally 20 feet wide. The degree of horizontal curvature is approximately 25°30' on the west curve and 28° on the east curve. The vertical grade is uniform and less than 1%. The west curve is on a 1.3:1 fill directly above the river on the south and has a rock cliff adjacent to the roadway on the north. The roadway has no signing except for a falling rock warning sign and it has a double yellow centerline throughout the site. The striping is fading and has been obliterated in some areas by pavement maintenance. The ADT has been determined to be 230 vehicles per day based on a 24 hour machine count on 31 July to 1 August 1981 and the truck traffic is estimated to be 10%. sight distance approaching the curve is as follows:

1. Approaching the west curve from the west - 315 feet
2. Approaching the west curve from the east - 530 feet
3. Approaching the east curve from the west - 380 feet
4. Approaching the east curve from the east - 430 feet

The sight distance around the west curve is approximately 125 feet due to the rock cliff on the inside edge. The sight distance around the east curve is approximately 100 feet but could be improved significantly by removing brush adjacent to the roadway. The posted speed on the River Road is 45 miles per hour. Superelevation varies from 0.038 ft./ft. near the center to 0 ft./ft. near the ends of both curves. Both curves were traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curves should be traveled was determined to be 20 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

Four accidents were recorded at this site during the five year period from 1976 to 1980. Three were on the west curve and one was on the east curve. Two involved icy roads. Two of the accidents were at night. All of the accidents were caused by an inability of the driver to properly negotiate the curves.

SHORT TERM IMPROVEMENTS

The accident history and roadway characteristics suggest that advance warning for the curves with 20 MPH advisory speed plates would be desirable. Delineators around the outside edge of the curves are recommended. Because of the steep fill slopes adjacent to the river south of the curves, guardrails are recommended. Guardrails will also help make the sharp curves more visible to approaching vehicles. The existing double yellow centerline stripe is important in this area and should be given a high priority in the county's maintenance and striping programs. Short term improvements should also include brush and weed removal to improve site distance around the curve. The estimated cost of short term improvements is $6700.

LONG TERM IMPROVEMENTS

No long term improvements are recommended at this time. The two existing curves are very severe and realigning the curves to improve the horizontal alignment would improve the safety and comfort of the curves. However, because of the difficulty and expense of changing the alignment between the river and the rock cliffs and because of the low traffic volumes, such construction is not recommended.

As the existing pavement is worn out and reconstruction becomes necessary, the roadway should be reconstructed with adequate superelevation and superelevation runoff based on an engineered design and construction staking.

ACCIDENT DATA

SITE NUMBER 8 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
1		1	2	

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
1		1	1			1

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1								2		1	

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
2			2	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
3		1		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
2	2		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES	1		1	1	
FATALITIES					
P. D. O.				1	

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

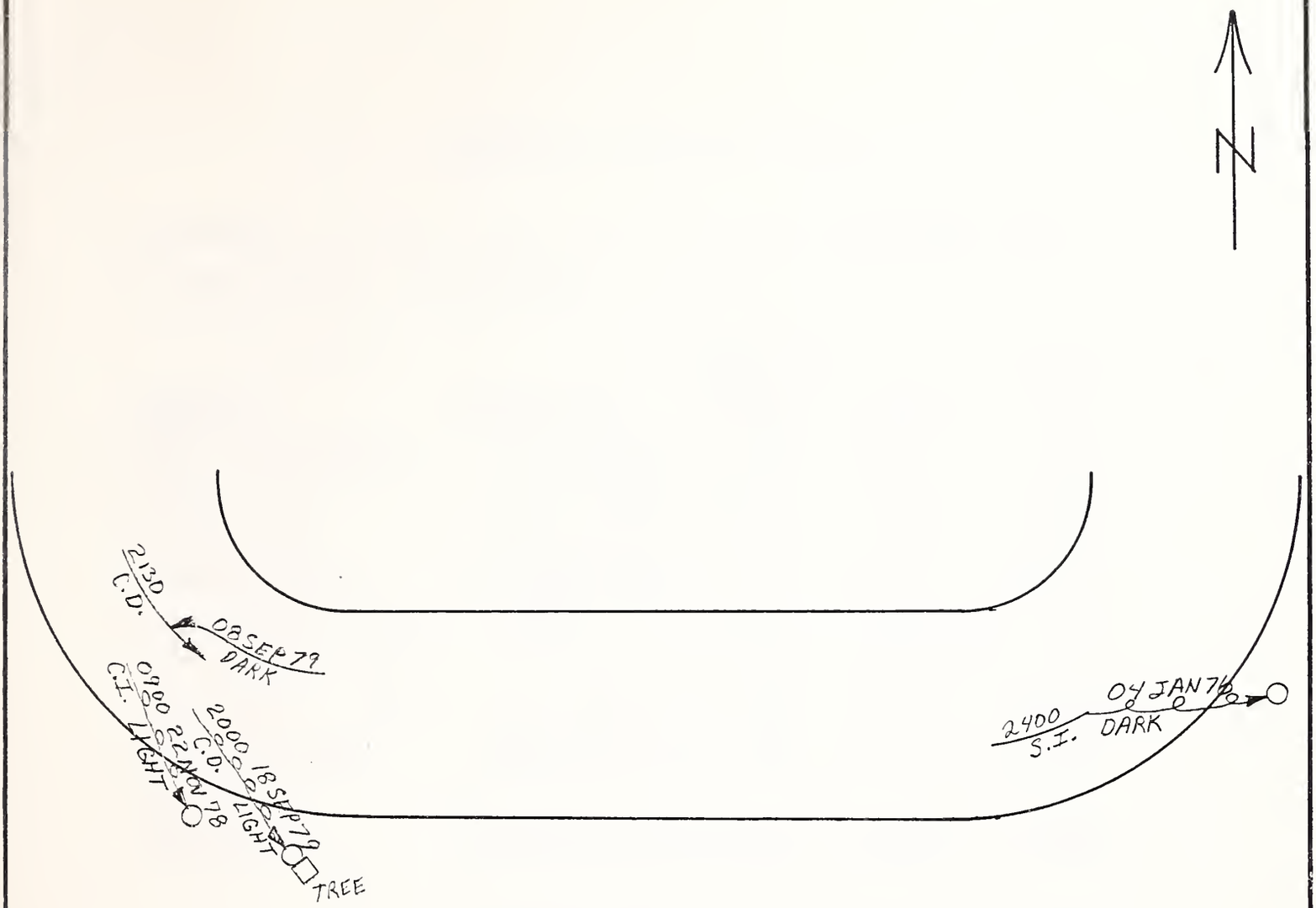
0	1	2	3	4	5	6
1	3					

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
4						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
			1			1	2	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 DATE 08 AUG. 79

WEATHER R.W. LIGHT DARK

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION RIVER ROAD SITE 8

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 8 Date September 1981

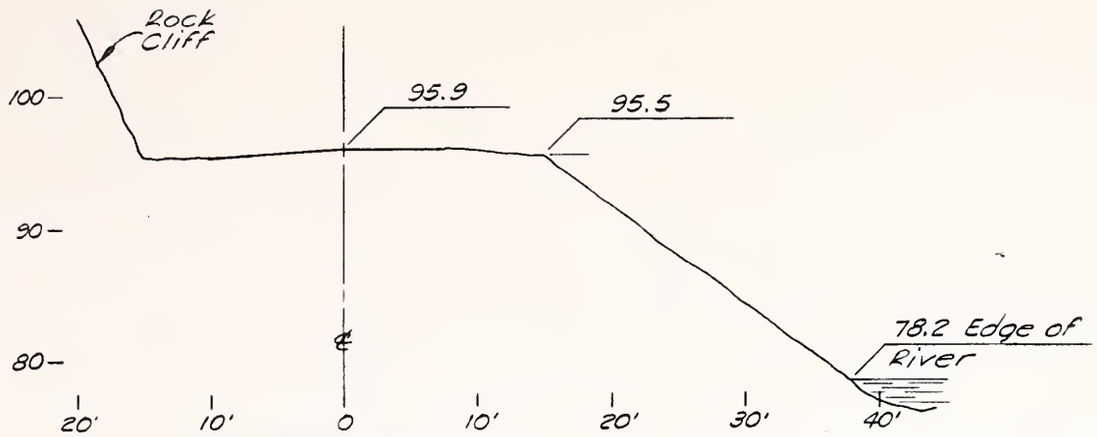
Site Description River Road

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.8 acc/yr	23	x 0.164 =	3.77
Accident Rate	9.5 acc/MEV	98	x 0.225 =	22.05
Accident Severity	11,100 dollars	67	x 0.191 =	12.08
Volume/Capacity Ratio	0.08	24	x 0.082 =	1.97
Sight Distance Ratio	(wt.avg)	36	x 0.074 =	2.66
Driver Expectancy	3.0 (wt.avg)	50	x 0.149 =	7.45
Info. System Deficiencies	6.0 (wt.avg)	100	x 0.115 =	11.50
	Hazard Index:			62.20

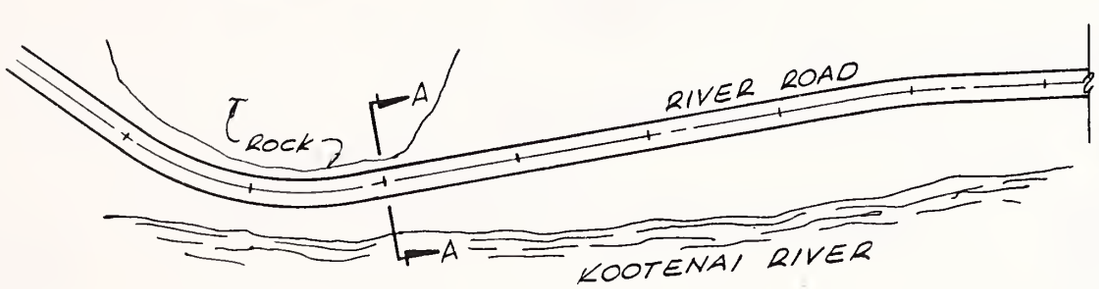
Cost of Short Term Improvements $6700

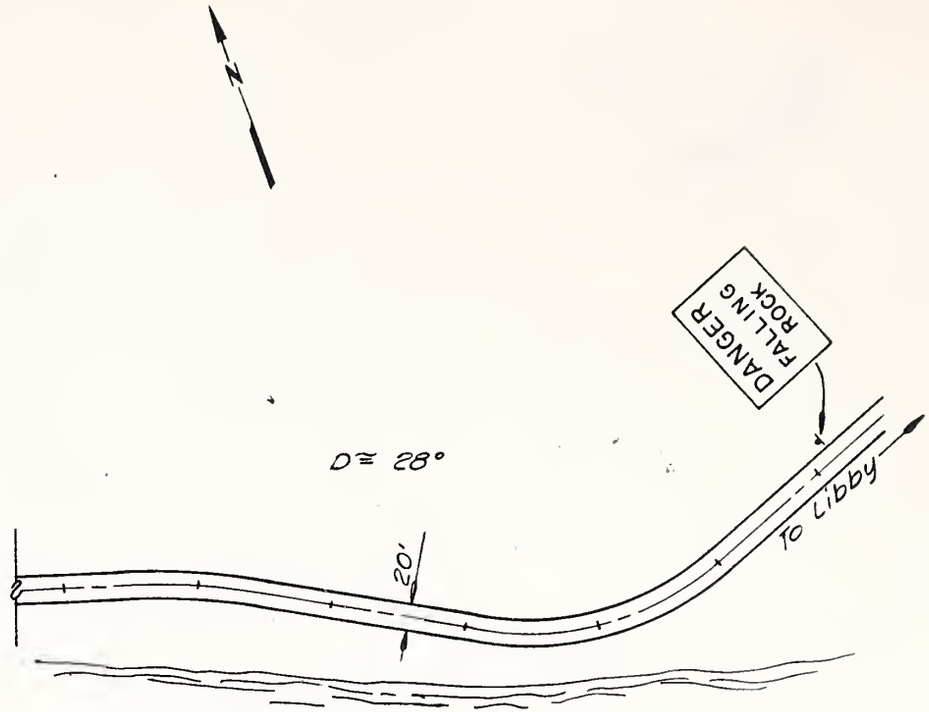
Cost Factor - 10.0

Priority Index = 62.20 X 0.75 + 10.0 X 0.25 = 49.2



D ≅ 25°30'



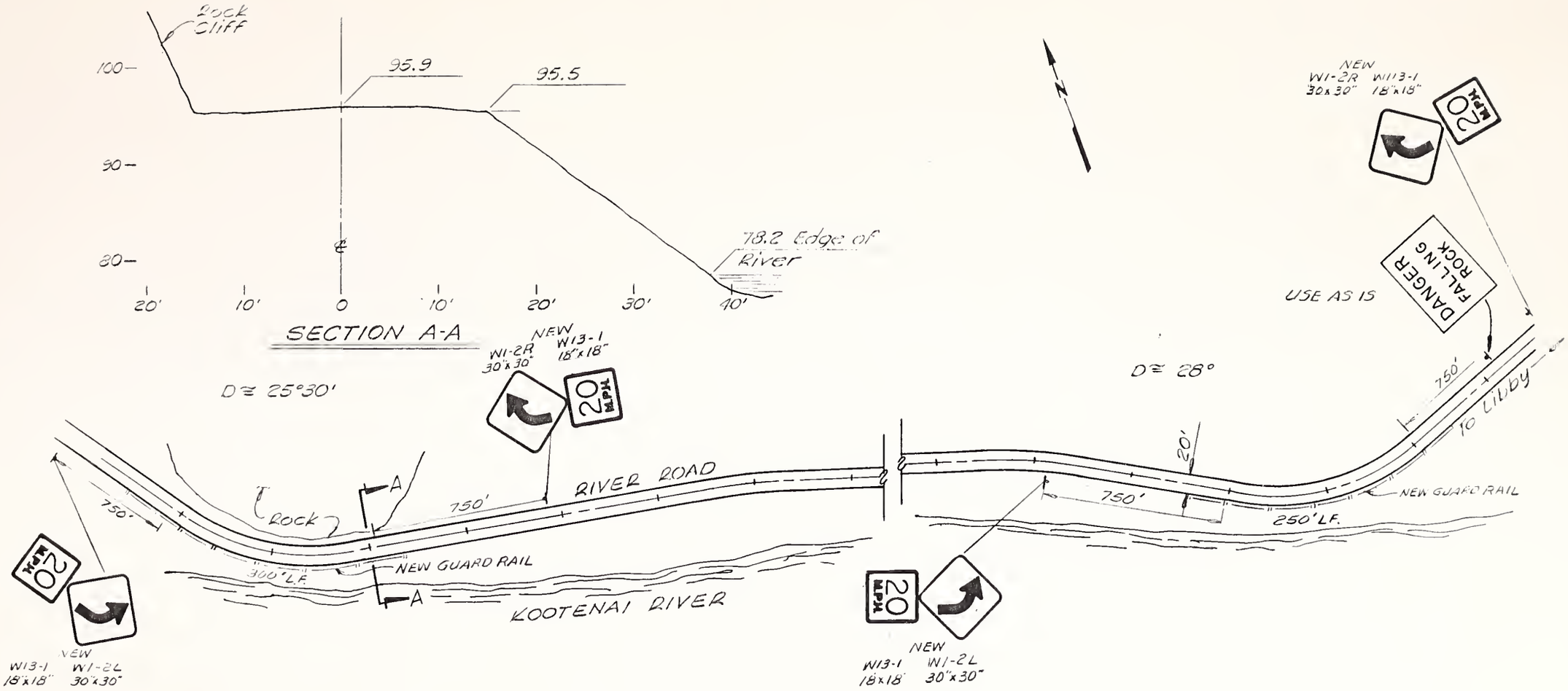


D ≅ 28°

SITE 8

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

2 - W1-2L (30"x30")
2 - W1-2R (30"x30")
4 - W13-1 (18"x18" 2MPH)
4 - 4"Ø POLE @ 14'
550' NEW METAL GUARD RAIL

SITE 8

Short Term Improvements

MORRISON-MAIERLE, INC
CONSULTING ENGINEERS

SITE 9

SITE NUMBER 9 - 2nd STREET EXTENSION

LOCATION

Site 9 includes two sharp curves separated by a 300 foot tangent located just northwest of the Libby City Limit. The road passes through a light density residential area and runs from Libby, west to connect with U.S. 2.

EXISTING CONDITIONS

The roadway consists of a 20 ft. wide asphalt surface with a uniform, flat grade. The two curves have radii of approximately 100 feet making their degree of curvature approximately 57°. There are reverse turn signs located at each end of the site but there are no advisory speed plates. There is no pavement striping. The ADT was determined to be 1150 vehicles per hour based on 24 hour machine counts on 28, 29 and 30 July 1981. Truck traffic is estimated to be 10%. Sight distance approaching the curves from either direction is more than twice the desireable safe stopping sight distance. The posted speed is 25 miles per hour. Superelevation on the north curve varies from 0 ft./ft. at the curve end to 0.021 ft./ft. at the curve center and on the south curve, superelevation varies from 0 ft./ft. at the curve ends to 0.059 ft./ft. near the curve center. The curves were traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curves should be traveled was determined to be 15 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

There were 9 accidents recorded at the site during the five year period from 1976 to 1980 - - more than any of the other sites in this study. Seven of the accidents occured on the north curve, suggesting that the lack of superelevation compared with the south curve (0.021 ft./ft. versus 0.059 ft./ft.) contributed to the hazard. All of the accidents involved the inability of the drivers to properly negotiate the curve. The accident history and character of the roadway suggest that more adequate advance warning and better identification of the curves is needed.

SHORT TERM IMPROVEMENTS

It is recommended that advisory speed signs be added to the turn advance warning signs already in place. Large arrows and delineators should be installed to help emphasize the severity of the curves. The estimated cost of the short term improvements is $675.00.

LONG TERM IMPROVEMENTS

Both curves should be widened and reconstructed with proper superelevation and superelevation runoff. The American Association of State Highway and Transportation Officials (AASHTO) recommends that for a rural roadway with a 30 mile per hour design speed and a maximum superelevation rate of 0.08 ft./ft., a radius of 250 feet be used for design of the curves. They also recommend a minimum of 145 feet superelevation runoff be provided. Widening the curves will require additional right-of-way, removal of a large tree and reconstruction of a small irrigation ditch. The estimated cost of long term improvements is $40,600.00.

ACCIDENT DATA

SITE NUMBER 9 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
1	1	1	2	4

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
2		2		2	2	1

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
	1			1		2			1	1	3

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
5	2		2	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
5	2	2		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
5	4		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES		1	1	2	2
FATALITIES					
P. D. O.	1				2

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

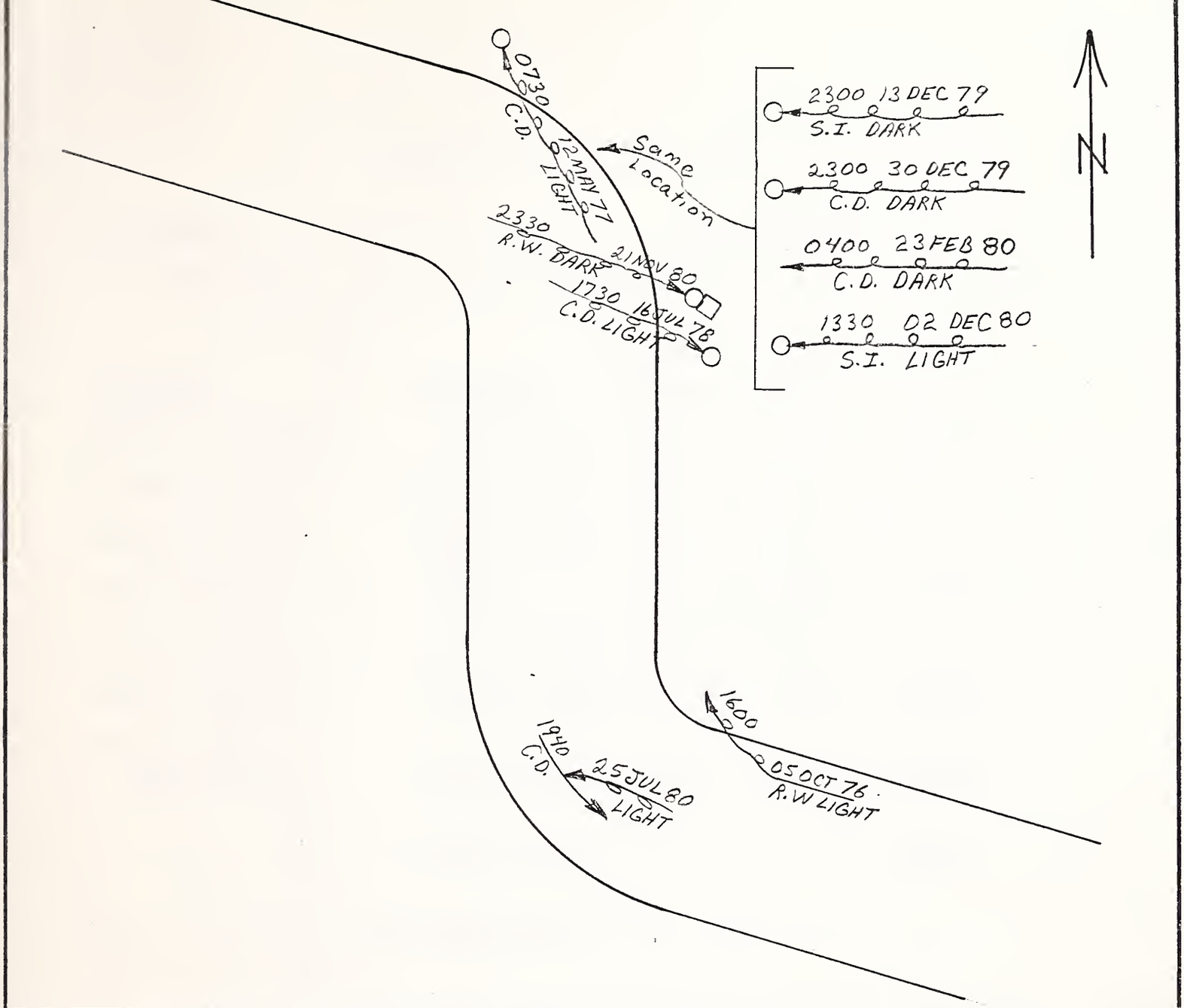
0	1	2	3	4	5	6
3	2	3		1		

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
9						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
			1			1	7	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 — DATE 08 AUG. 79

WEATHER R.W. — LIGHT DARK

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION SECOND STREET EXTENSION — SITE 9

PERIOD 5 YEARS — FROM 1976 — TO 1980

PREPARED BY B. PETERSON — DATE SEP 1981

DETERMINATION OF HAZARD INDEX

Site Number 9 Date September 1981

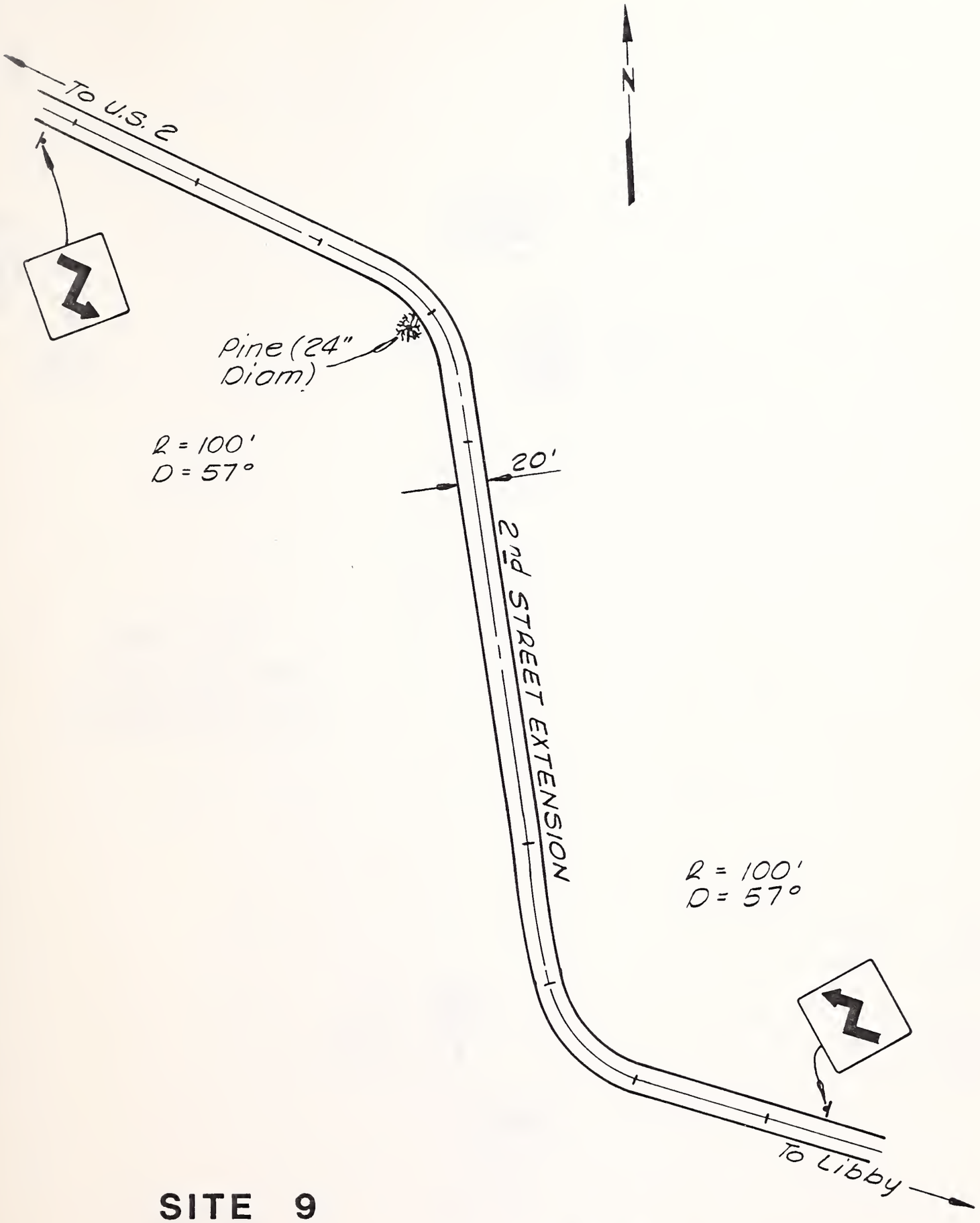
Site Description 2nd Street Extension

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	1.8 acc/yr	36	x 0.164 =	5.90
Accident Rate	4.4 acc/MEV	61	x 0.225 =	13.73
Accident Severity	7244 dollars	56	x 0.191 =	10.70
Volume/Capacity Ratio	0.39	57	x 0.082 =	4.67
Sight Distance Ratio	(wt.avg)	0	x 0.074 =	0
Driver Expectancy	5.0 (wt.avg)	83	x 0.149 =	12.37
Info. System Deficiencies	3.0 (wt.avg)	50	x 0.115 =	5.75
	Hazard Index:			53.12

Cost of Short Term Improvements $675

Cost Factor - 98.3

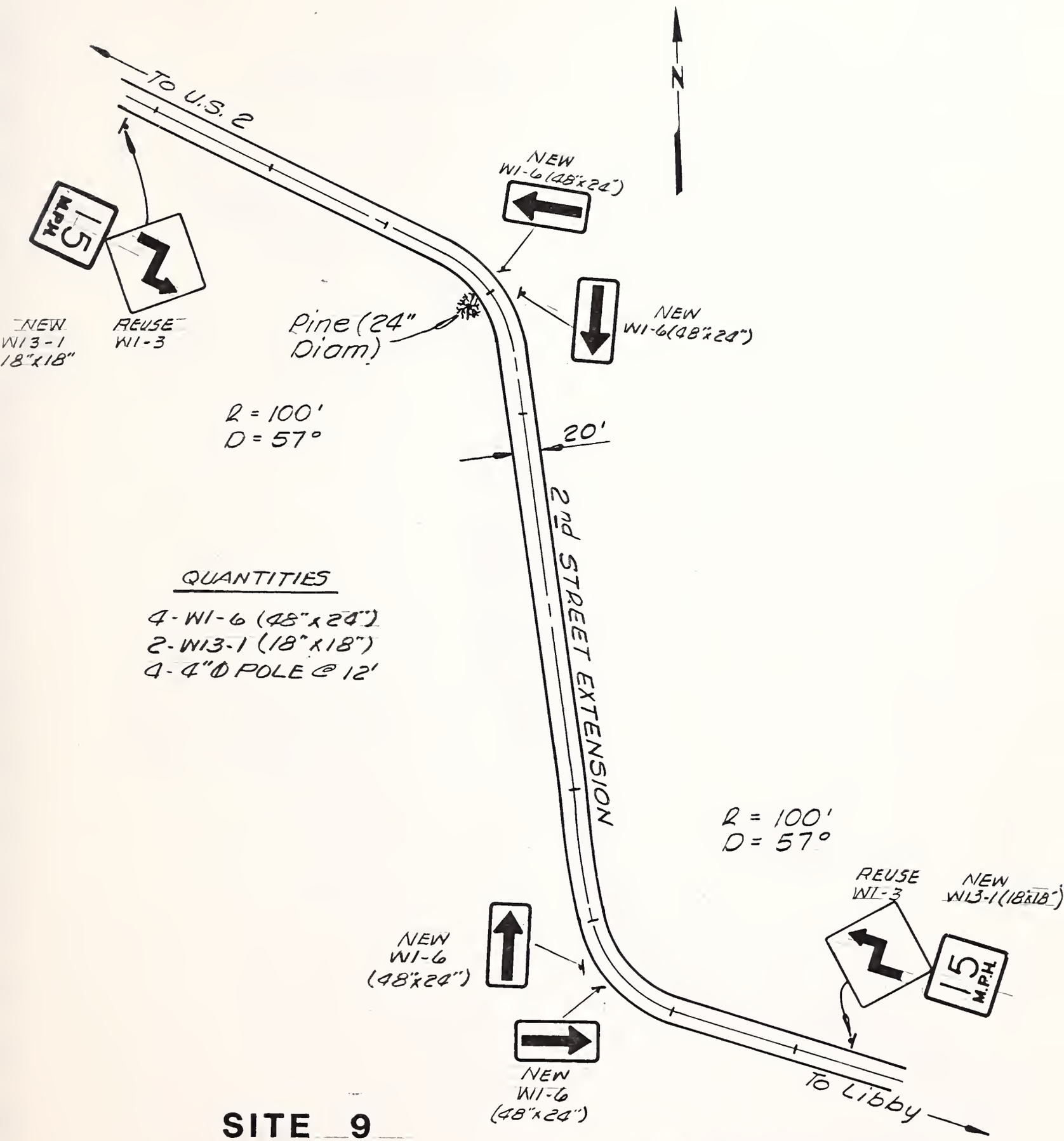
Priority Index = 53.12 X 0.75 + 98.3 X 0.25 = 64.4



SITE 9

Existing Conditions

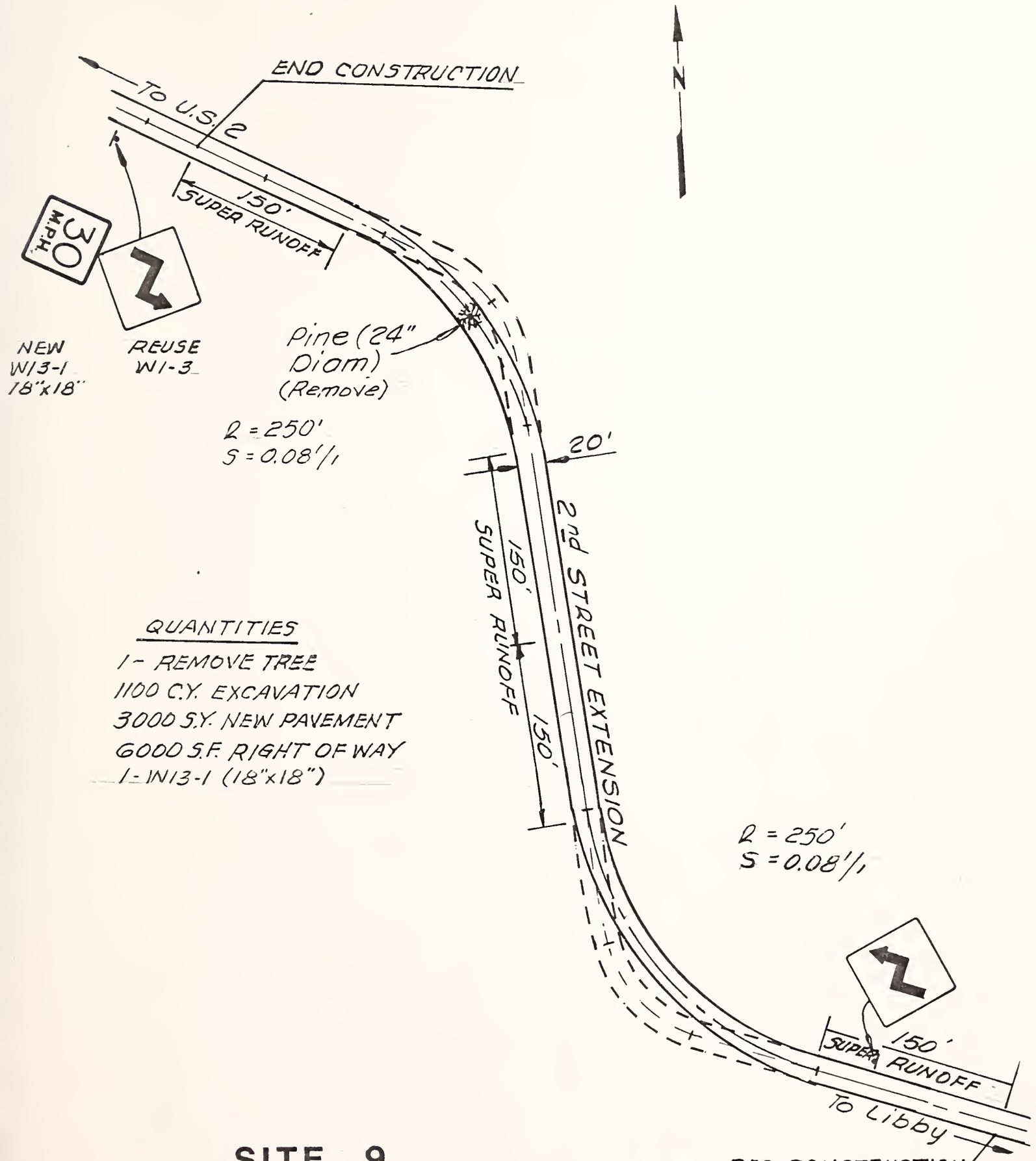
MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



SITE 9

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



SITE 9

Long Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

SITE 10

SITE NUMBER 10 - SHAUNESSEY HILL
JUNCTION TO GOLF COURSE ROAD

LOCATION

This intersection is located near the Cabinet Heights Subdivision. It is a non-typical four legged intersection. Traffic is residential and recreational to the golf course.

EXISTING CONDITIONS

All legs of the intersection are asphalt paved. Legs A and D are 20 feet wide and Legs B and C are 14 feet wide. Grades are uniform and less than three percent. Degree of curvature on the through roadway, leg A-D is 50°. There is no pavement striping in the area. Legs B and C are controlled by yield signs and there is one SPEED LIMIT 25 sign located near Leg B. ADT was determined to be 650 vehicles per day on Leg A, 120 vehicles per day on Leg B, 220 vehicles per day on Leg C and 325 vehicles per day on Leg D based on 24 hour machine counts on 30 to 31 July 1981. Truck traffic is estimated to be 10%. Sight distance approaching the intersection is as follows:

Approach A	200 feet
Approach B	Not Applicable
Approach C	240 feet
Approach D	375 feet

The posted speed limit is 35 miles per hour. The curve from Leg A to Leg D was traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve should be traveled was determined to be 25 miles per hour. Superelevation around the curve varies from 0.008 ft/ft near the end of the curve to 0.059 ft/ft near the center of the curve.

ACCIDENT HISTORY AND ANALYSIS

There were five accidents recorded during the five year period from 1976 to 1980. Three of the accidents involved the inability of the drivers

to negotiate the curve from Leg A to Leg D. Only two of the accidents were on icy or wet roads. Three of the accidents were at night.

SHORT TERM IMPROVEMENTS

It is recommended that, because of the poor sight distance at the intersection, the yield signs on Legs B and C be replaced with stop signs. An advance stop sign warning should be installed in advance of the stop sign on Leg C. Advance intersection warning signs and advance turn warning signs with advisory speed plates should be installed on Legs A and D in advance of the intersection and curves. Direction signs should be installed to help alleviate confusion at the intersection. The estimated cost of short term improvements is $900. Short term improvements should also include brush and weed removal to improve site distance around the curve.

LONG TERM IMPROVEMENTS

The intersection should be reconstructed as shown on the Long Term Improvements sketch. The proposed reconstruction will allow legs B and C to enter the intersection at a single approach. Widening the curve between legs A and D will allow the curve to be traveled at approximately 35 mph and will improve the sight distance to the intersection. The roadway should be striped and appropriate signing, as shown on the sketch, should be added. The estimated cost of long term improvements is $80,000.

ACCIDENT DATA

SITE NUMBER 10 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
1	1		1	2

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
	2		1	2		

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1				1	1	1		1			

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
3	1	1		

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
3	1	1		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
2	3		

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES		1			1
FATALITIES					
P. D. O.	1			1	1

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

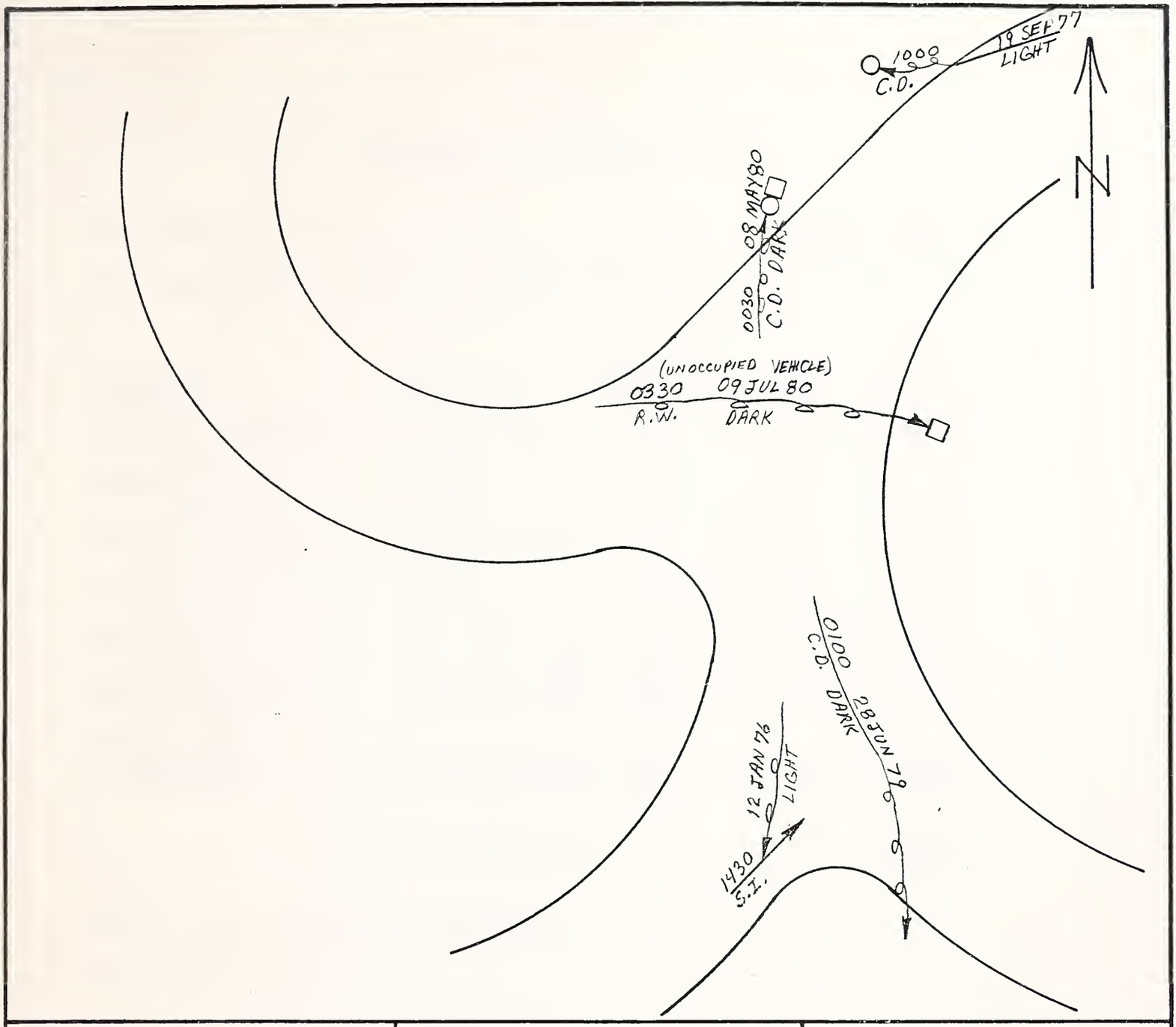
0	1	2	3	4	5	6
3	1	1				

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
5						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
			2			1	2	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 — DATE 08 AUG. 79

R.W. — DARK

WEATHER — LIGHT

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION SHAUNNESSY HILL JUNCTION TO GOLF COURSE ROAD SITE 10

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 10 Date September 1981

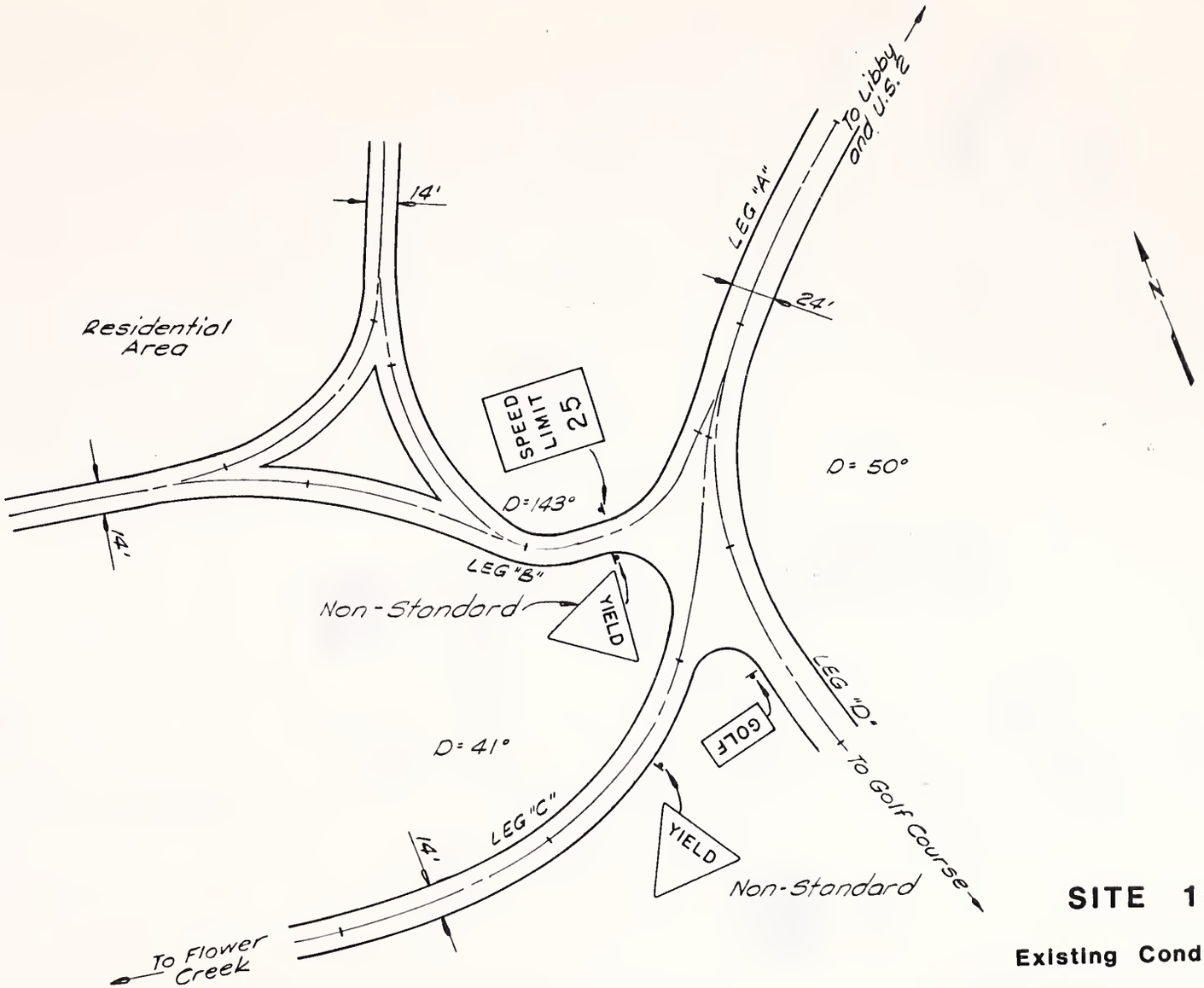
Site Description Shaunessey Hill Junction to Golf Course Rd.

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	1.2 acc/yr	29	x 0.164 =	4.76
Accident Rate	3.3 acc/MEV	49	x 0.225 =	11.03
Accident Severity	12720 dollars	71	x 0.191 =	13.56
Volume/Capacity Ratio	0.11	29	x 0.082 =	2.38
Sight Distance Ratio	(wt.avg)	53	x 0.074 =	3.92
Driver Expectancy	4.7 (wt.avg)	78	x 0.149 =	11.62
Info. System Deficiencies	5.0 (wt.avg)	83	x 0.115 =	9.55
	Hazard Index:			56.81

Cost of Short Term Improvements $900

Cost Factor - 95.5

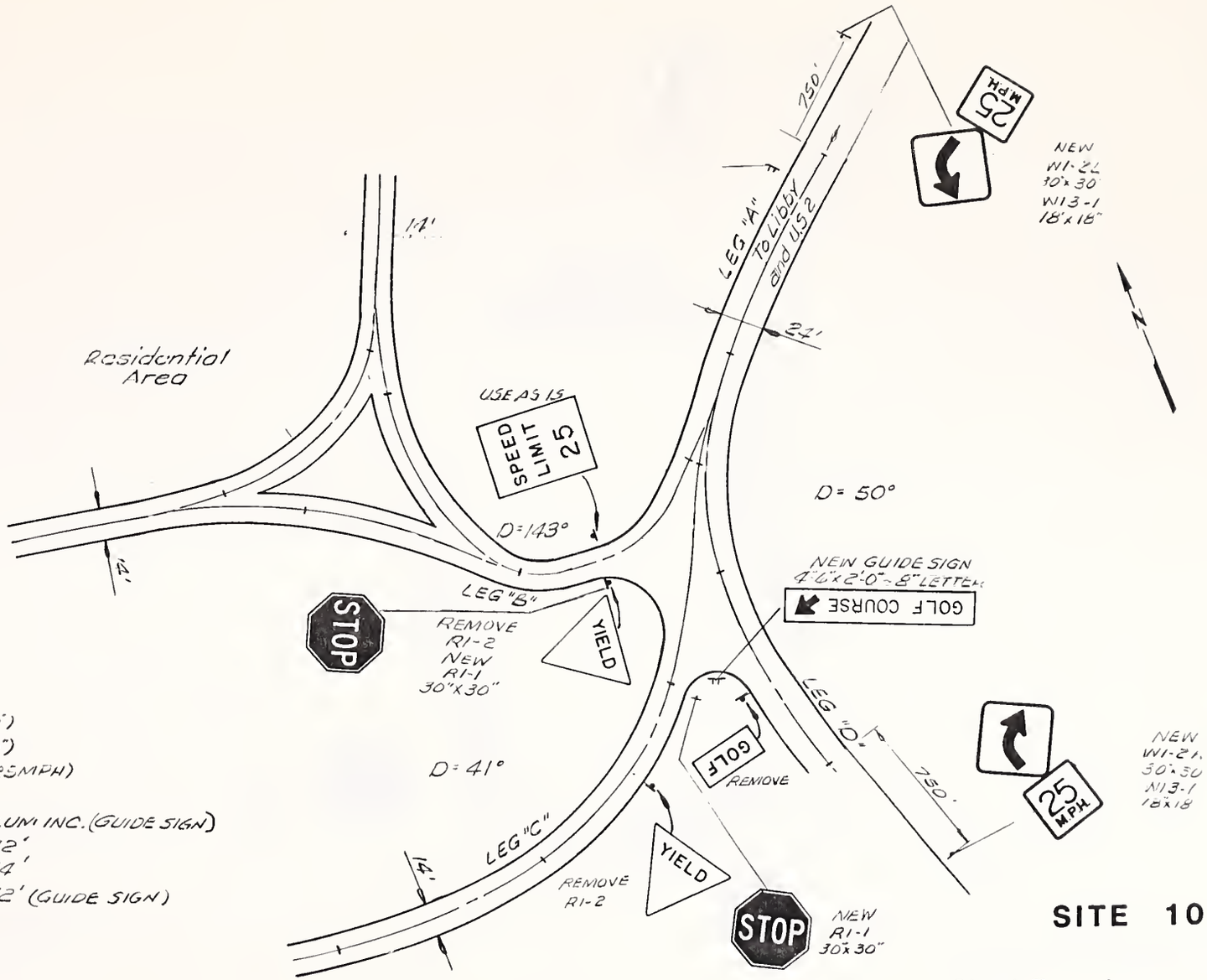
Priority Index = 56.81 X 0.75 + 95.5 X 0.25 = 66.5



SITE 10

Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



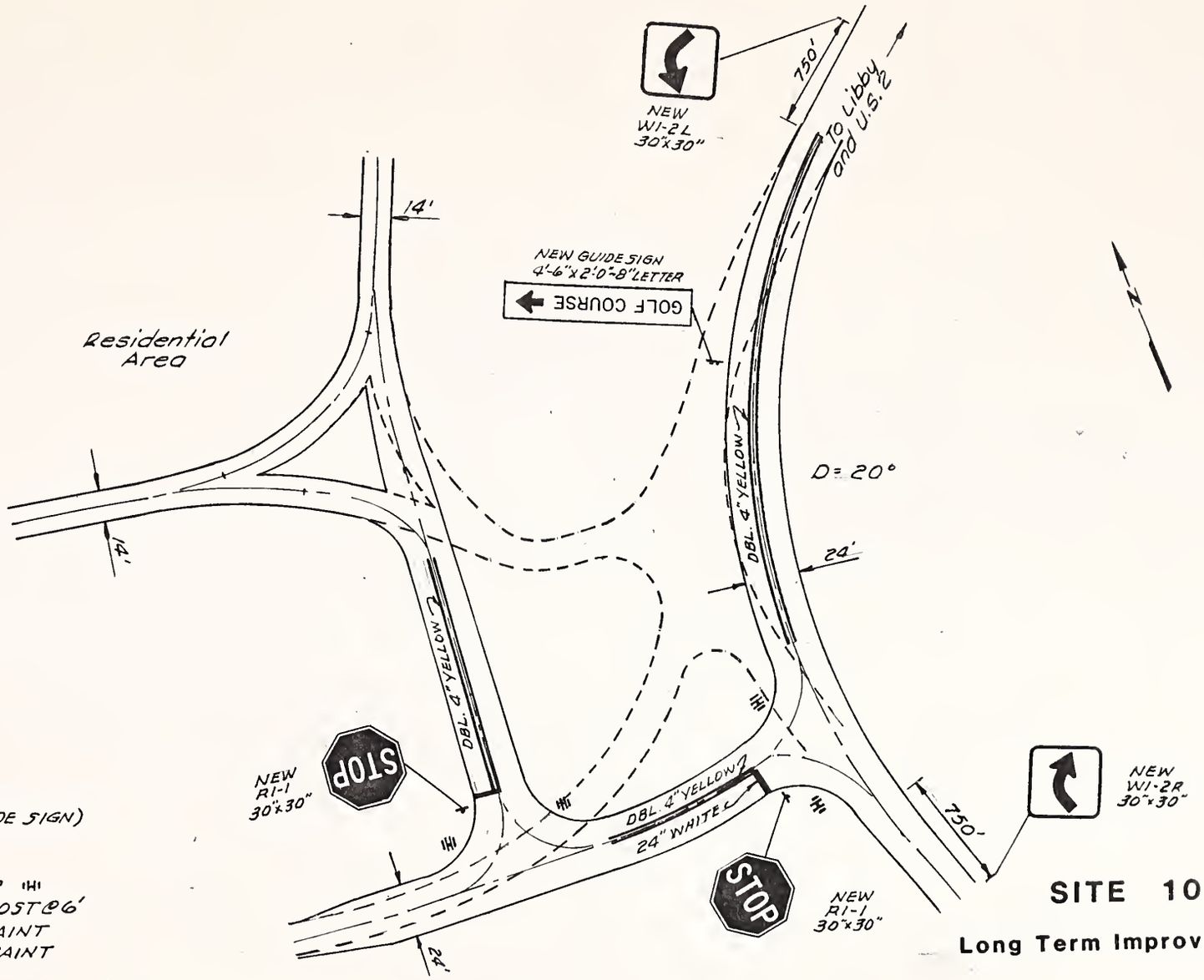
QUANTITIES

1- W1-2 L (30"x30")
1- W1-2 R (30"x30")
2- W13-1 (18"x18": 25MPH)
2- R1-1 (30"x30"
9 ½ SQ FT. SHT. ALUM. INC. (GUIDE SIGN)
2- 4"Ø POLE @ 12'
2- 4"Ø POLE @ 14'
2- 4"Ø POLE @ 12' (GUIDE SIGN)
3 SIGN REMOVE

SITE 10

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1 - W1-2L - 30"x30"
1 - W1-2R - 30"x30"
2 - R1-1 - 30"x30"
9 @ 5Q.FT. SHT. ALUM. INC. (GUIDE SIGN)
4 - 4" Ø POLE @ 12'
2 - 4" Ø POLE @ 13'
4 - DESIGN "D" DELINEATOR
4 - METAL "U" DELINEATOR POST @ 6'
1 GAL. WHITE STRIPING PAINT
1 - GAL. YELLOW STRIPING PAINT
4000 C.Y. EXCAVATION
2800 S.Y. NEW PAVEMENT
31000 SQ. FT. NEW R/W

SITE 10

Long Term Improvements

MORRISON-MAIERLE, INC
CONSULTING ENGINEERS

SITE 11

SITE NUMBER 11 - GLEN LAKE ROAD

LOCATION

Site 11 includes a horizontal curve section of the Glen Lake Road located just east of the southern section of Glen Lake. The road is used mainly for access to residences and recreational interests in the area.

EXISTING CONDITION

The Glen Lake Road, in the area of Site 11, has a 20 foot wide asphalt paved roadway. The alignment includes a horizontal curve with a degree of curvature of 40 in combination with a vertical grade of nearly 6%. There is no signing or pavement striping in the site area. ADT was determined to be approximately 100 vehicles per day based on a one hour manual count on 2 September 1981. Truck traffic is estimated to be 10%. Sight distance approaching the curve from the east is approximately 760 feet and approaching from the south the sight distance is approximately 540 feet. The posted speed limit is 35 miles per hour. The superelevation varies from 0.014 ft./ft. near one end of the curve to 0.028 ft./ft. near the center of the curve. The curve was traveled with a vehicle equipped with a ball-bank indicator and the safe speed at which the curve should be traveled was determined to be 25 miles per hour.

ACCIDENT HISTORY AND ANALYSIS

Two accidents were recorded on the curve during the five year period from 1976 to 1980. Both accidents involved the inability of the drivers to properly negotiate the curve. One of the accidents occurred on icy roads and one occured on a dry road surface. The accident history and the character of the roadway indicate that advance warning for the curve is needed.

SHORT TERM IMPROVEMENTS

Turn warning signs with advisory speed signs are recommended. Delineators should also be installed along the outside edge of the curve. The estimated cost of short term improvements is $425.00.

LONG TERM IMPROVEMENTS

No long term improvements are recommended at this time, but as the existing pavement wears out, it should be replaced with a roadway constructed with the proper superelevation and superelevation runoff based on an engineered design and construction staking. Constructing the recommended superelevation and superelevation runoff will allow the safe driving speed of the curve to rise above the 25 miles per hour indicated by the ball-bank indicator.

ACCIDENT DATA

SITE NUMBER 11 ACCIDENT PERIOD 1976 TO 1980

NUMBER OF ACCIDENTS BY YEAR

1976	1977	1978	1979	1980
2				

NUMBER OF ACCIDENTS BY DAY OF WEEK

SUN.	MON.	TUE.	WED.	THUR.	FRI.	SAT.
	1				1	

NUMBER OF ACCIDENTS BY MONTH

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
								1		1	

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

DRY	WET	SNOW	ICE	OTHER
1			1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

CLEAR	RAIN	SNOW	FOG	OTHER
2				

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

DAYLIGHT	DARK	DUSK	DAWN
	1		1

NUMBER OF ACCIDENTS BY SEVERITY

	1976	1977	1978	1979	1980
INJURIES	1				
FATALITIES					
P. D. O.	1				

NUMBER OF ACCIDENTS BY NUMBER OF INJURIES

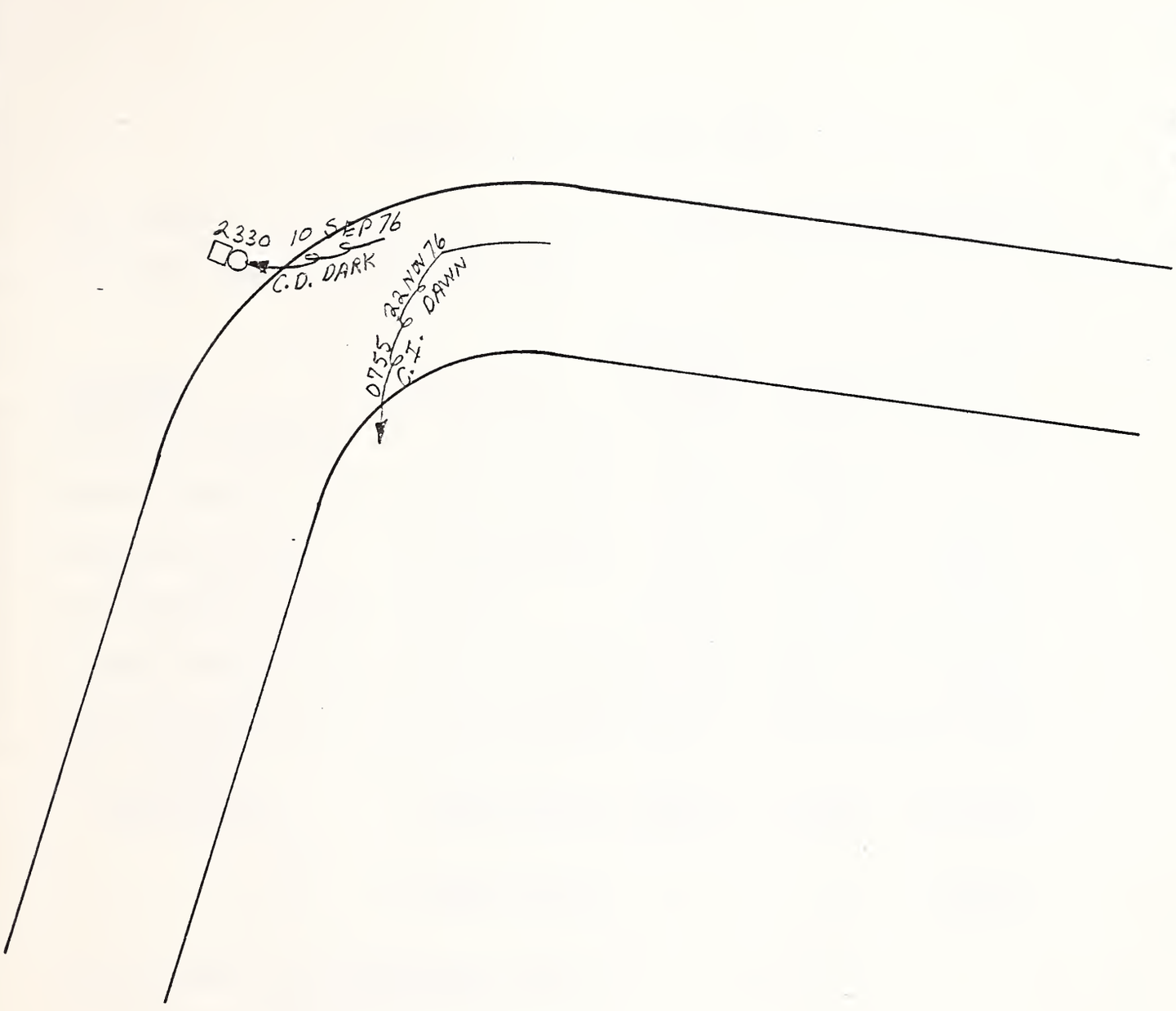
0	1	2	3	4	5	6
1		1				

NUMBER OF ACCIDENTS BY NUMBER OF FATALITIES

0	1	2	3	4	5	6
2						

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

ANGLE	LT.-TURN	R-END	FX-OBJ.	PED.	ANIMAL	SDSWP	NON-COL.	HD-ON
			1				1	



SYMBOLS

- VEHICLE PATH
- PEDESTRIAN PATH
- BACKING VEHICLE
- PARKED VEHICLE
- FIXED OBJECT
- FATAL ACCIDENT
- INJURY ACCIDENT

COLLISION TYPE

- REAR END
- HEAD ON
- SIDESWIPE
- OUT OF CONTROL
- RIGHT ANGLE
- LEFT TURN

CONDITIONS

TIME 1500 DATE 08 AUG. 79

WEATHER R.W. LIGHT DARK

PAVEMENT

WEATHER : R = RAIN
F = FOG, C = CLEAR, S = SNOW

PAVEMENT : D = DRY
W = WET, I = ICY

LOCATION GLEN LAKE ROAD SITE 11

PERIOD 5 YEARS FROM 1976 TO 1980

PREPARED BY B. PETERSON DATE SEPT 1981

DETERMINATION OF HAZARD INDEX

Site Number 11 Date September 1981

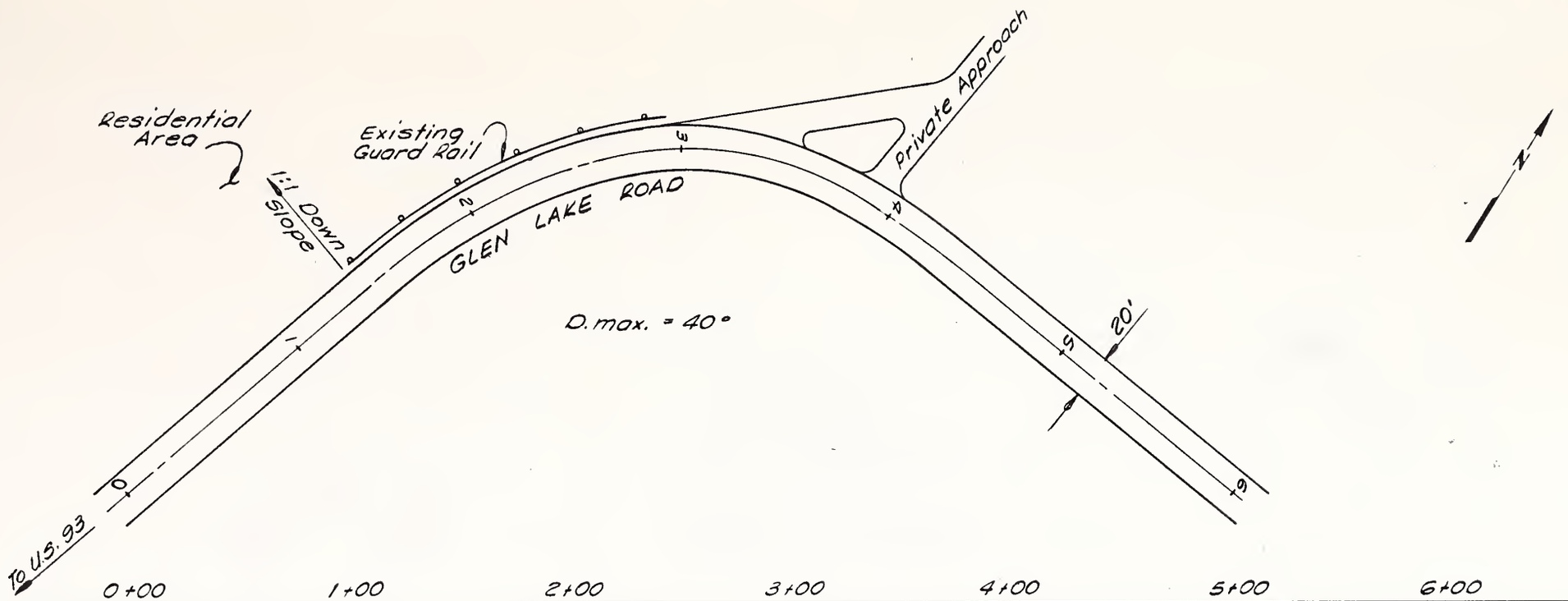
Site Description Glen Lake Road

Indicator	Data Value	Indicator Value	Weight	Partial H.I.'s
Number of Accidents	0.4 acc/yr	17	x 0.164 =	2.79
Accident Rate	8.1 acc/MEV	90	x 0.225 =	20.25
Accident Severity	12,400 dollars	70	x 0.191 =	13.37
Volume/Capacity Ratio	0.05	18	x 0.082 =	1.48
Sight Distance Ratio	(wt.avg)	1	x 0.074 =	0.07
Driver Expectancy	4.0 (wt.avg)	67	x 0.149 =	9.98
Info. System Deficiencies	6.0 (wt.avg)	100	x 0.115 =	11.50
	Hazard Index:			59.44

Cost of Short Term Improvements $525

Cost Factor - 88.2

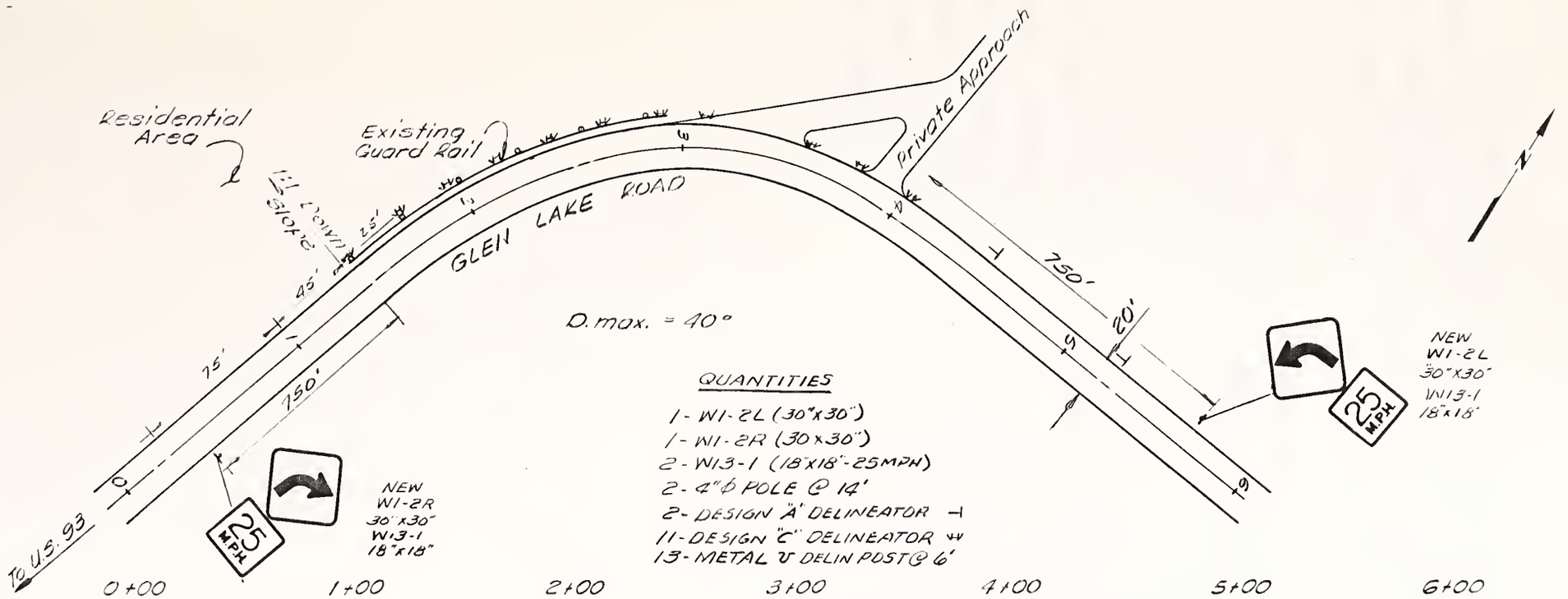
Priority Index = 59.44 X 0.75 + 88.2 X 0.25 = 66.6



SITE 11

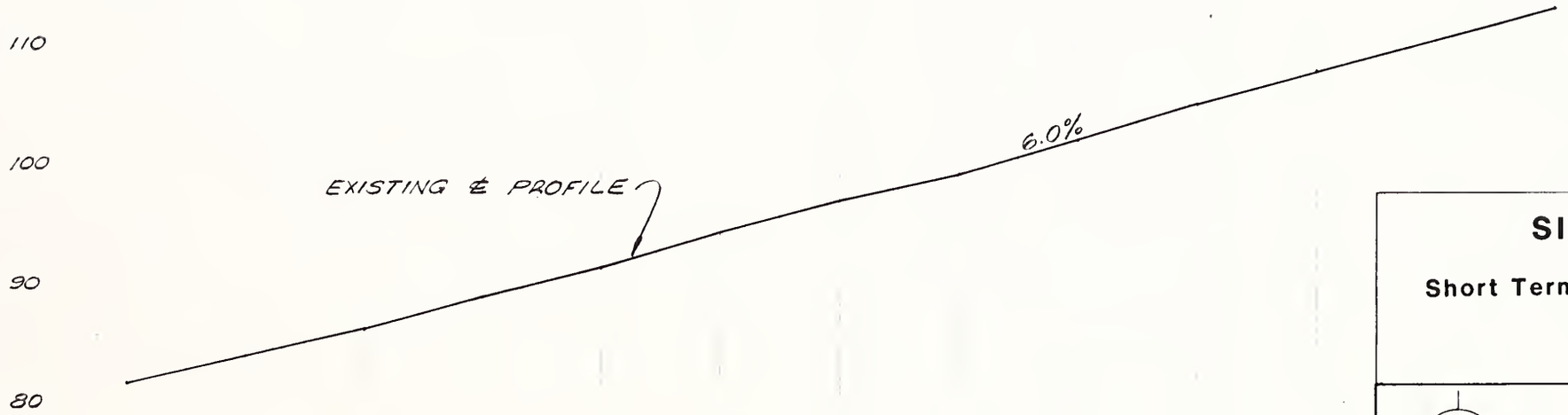
Existing Conditions

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS



QUANTITIES

1 - W1-2L (30"x30")
1 - W1-2R (30"x30")
2 - W13-1 (18"x18"-25MPH)
2 - 4"ϕ POLE @ 14'
2 - DESIGN "A" DELINEATOR
11 - DESIGN "C" DELINEATOR
13 - METAL U DELIN POST @ 6'



SITE 11

Short Term Improvements

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS

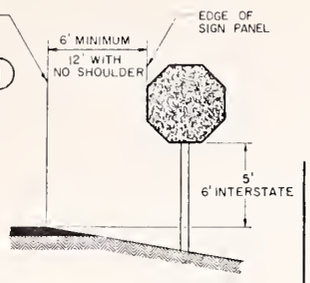
APPENDIX A - CONSTRUCTION AND PLACEMENT OF SIGNS

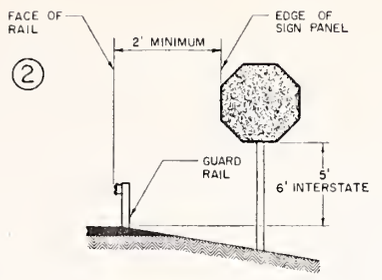
All signing should be constructed and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and should be placed in the locations shown on the Short and Long Term Improvements sketches of this report. Copies of the MUTCD are available from:

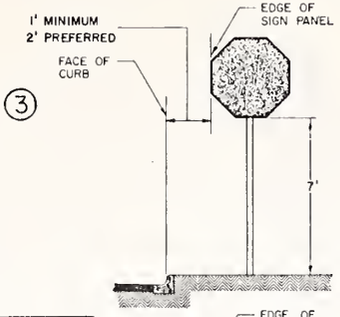
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

The following drawings, from "Standard Drawings", 1979 Edition, Montana Department of Highways, indicate standard clearance and mounting heights, typical approach road signing, treated timber pole details and delineator design. These drawings, along with information provided on the "Improvements" sketches, should give county maintenance personnel sufficient information to order materials and install the signing recommended for short term improvements.

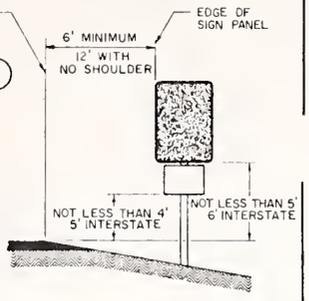
REGULATORY
R1-1

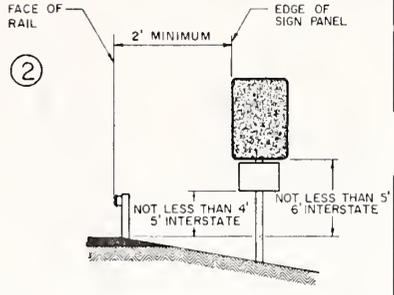


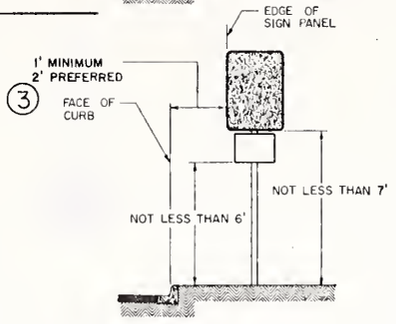




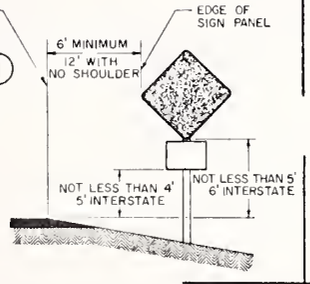
REGULATORY
ALL OTHERS

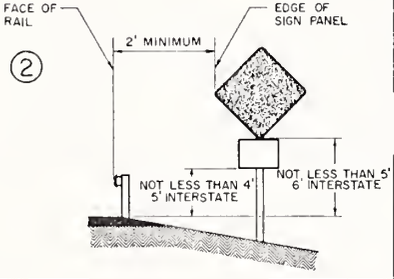


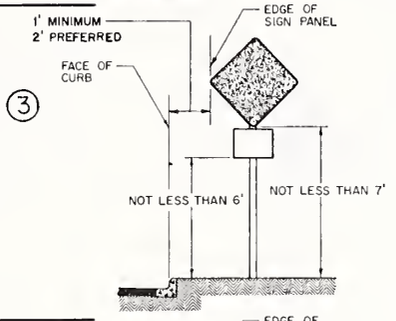




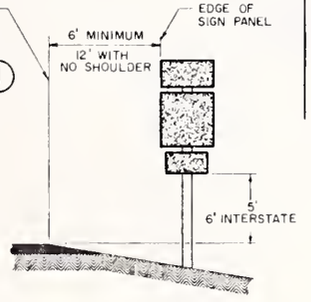
WARNING

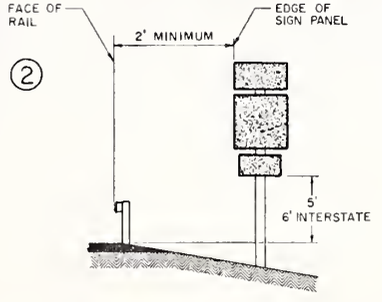


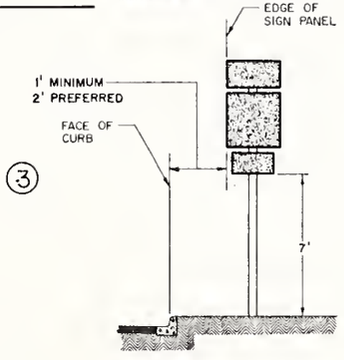




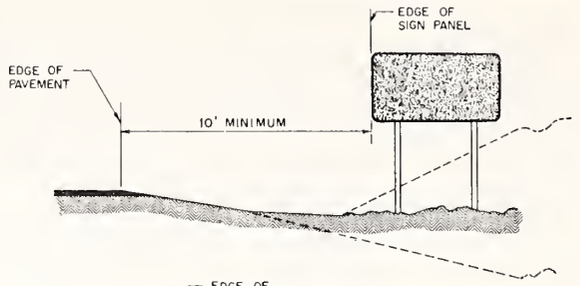
ROUTE MARKERS

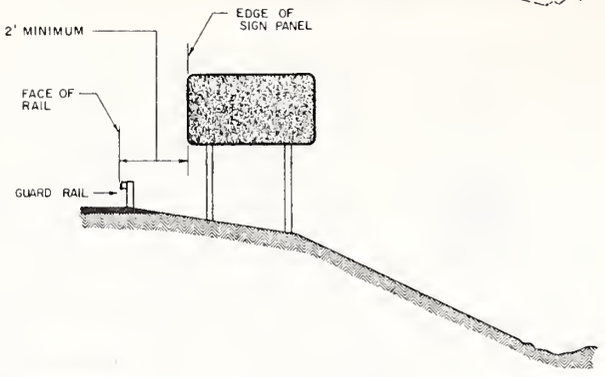






GUIDE SIGNS





NOTES

1. Information contained herein is the recommended clearances and mounting heights that shall be used when placing all signs
2. For Regulatory, Warning, and Route Marker Signs, and their assemblies, on highways other than Interstate:
   a). diagrams located in column (1) shall be used when placing these signs in standard RURAL conditions; column (2) shall be used when placing these signs behind Guard Rail in RURAL conditions, column (3) shall be used when placing these signs in URBAN conditions where there is adequate clearance and sidewalk width.
   b). where sidewalk width is limited in URBAN conditions, see Signing Standard Drawing No. 227 for placement details.
3. For Regulatory (All Others), Warning, and Route Marker Signs, and their assemblies, on Interstate Highways , the clearance should be 20' from edge of pavement in column (1) for standard RURAL conditions. The clearances listed in columns (2) and (3) shall remain as shown.
4. For Guide Signs, and their assemblies:
   a). the diagrams located above shall be used when placing these signs in the given RURAL conditions.
   b). for placement of these signs in URBAN conditions, see the Sign Location and Specification Sheets in the Signing Plans for each individual sign.
   c). the maximum clearance of these signs shall not exceed 35' in any condition.
   d) see Standard Drawing No. 220 for mounting heights

REVISED	10/8/74	4/1/79
EFFECTIVE	2/1/73	6/1/79

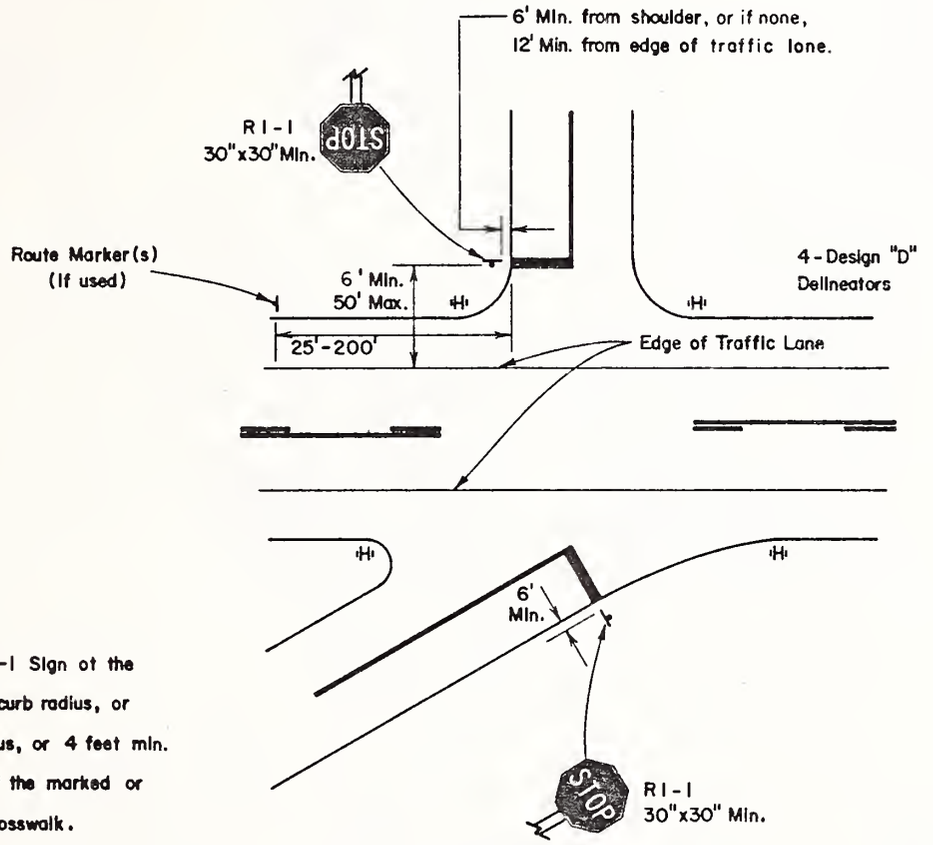
APPROVED
BY: Carl R Bickel
ADMINISTRATOR ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 215

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

TYPICAL SIGN CLEARANCES AND MOUNTING HEIGHTS

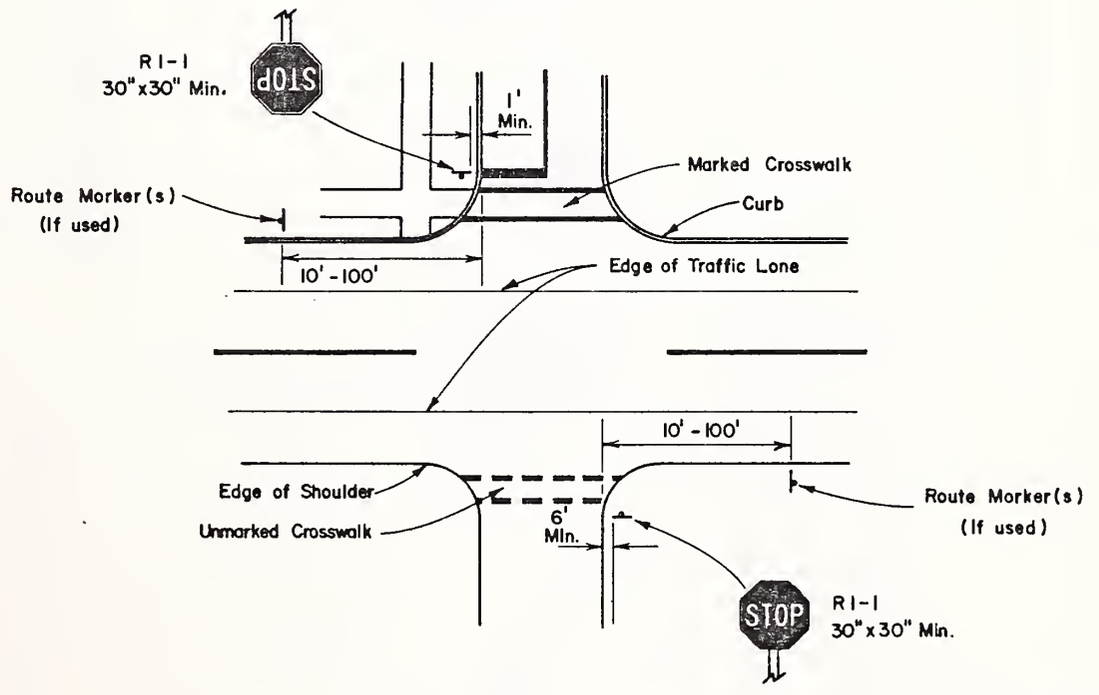
TYPICAL APPROACH ROAD SIGNING



NOTE:

Place R1-1 Sign at the beginning of curb radius, or shoulder radius, or 4 feet min. in advance of the marked or unmarked Crosswalk.

RURAL



URBAN

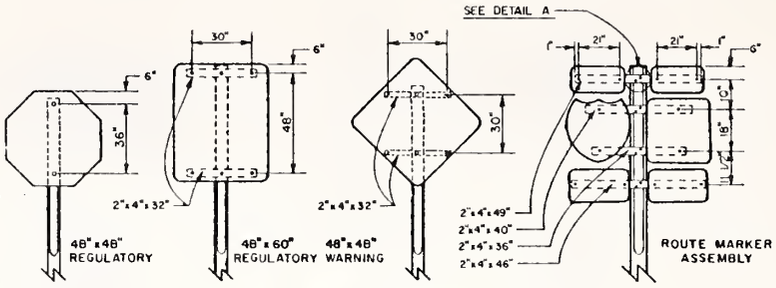
SIGNING STANDARD DRAWING NUMBER 216
TYPICAL RURAL AND URBAN APPROACH

REVISED	4/1/79		
EFFECTIVE	6/1/79		

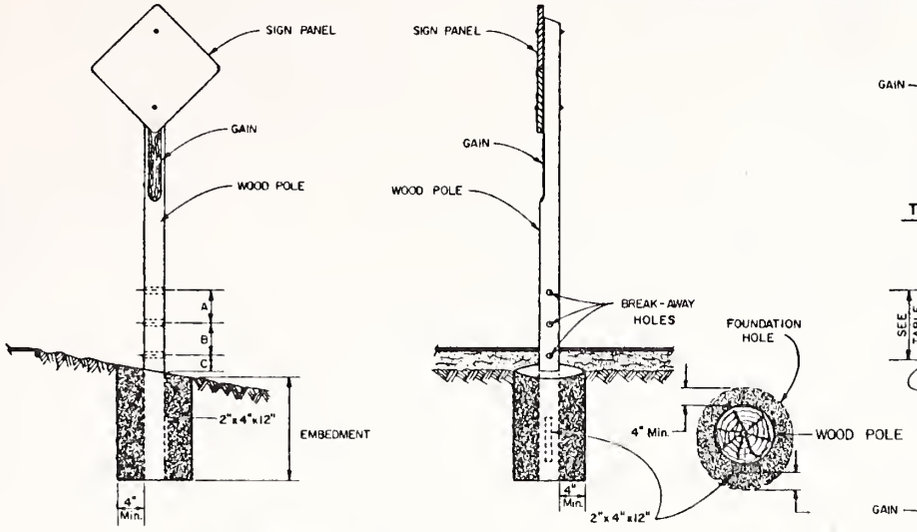
APPROVED:
BY _____
ADMINISTRATOR-ENGINEERING DIVISION

NOTES:

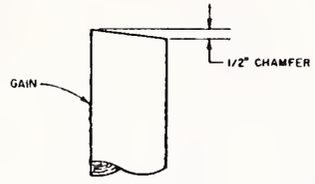
1. All Timber Poles shall conform to the 1976 State of Montana Department of Highways Standard Specifications.
2. All Timber Poles shall be full pressure treated as per the Standard Specifications.
3. All cutting, trimming, and boring of Treated Poles shall conform and be in accordance with the Standard Specifications.
4. All Poles shall be gained on the sign side a minumum as shown in the Table below for 1/2 the length of each pole as shown.
5. Break Away Details shall be standard for all Timber Wood Poles listed in the Table below, either on single or multiple sign supports.
6. All Back Bracing material shall be of Standard No. 2 or better grade S 4 S lumber, and shall meet all spec's listed in Section M-320.01 of the Standard Specifications.
7. All bolts, nuts, and washers shall be of Aluminum, Stainless Steel, or Cadmium Plated Steel material.
8. A 2"x 4"x12" board shall be attached 12" from the bottom of the Pole. Attachment shall be made by driving two nails (16d) through the 2"x 4" and into the Pole. The 2"x 4" shall be treated according to the Standard Specifications. The cost for all material and labor to accomplish this work shall be included in the Item — POLES - TREATED TIMBER - BARN of the contract.



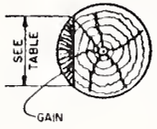
TYPICAL SIGN MOUNTINGS

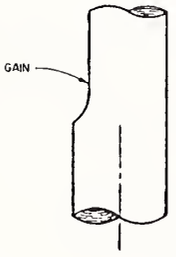


BREAK-AWAY AND FOOTING DETAILS

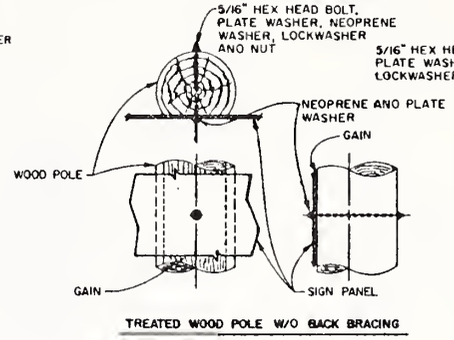


TOP END TREATMENT

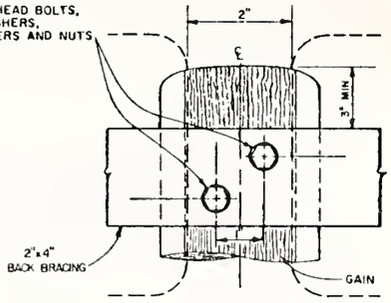




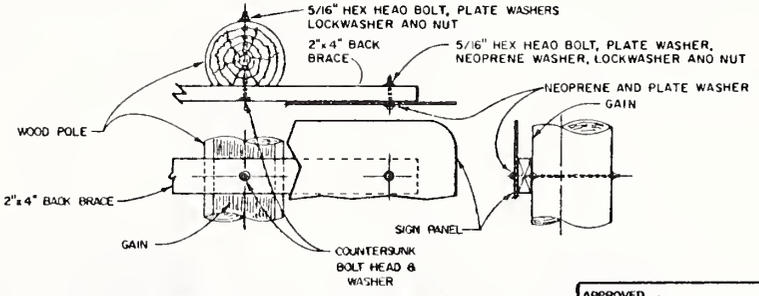
GAIN DETAIL



TREATED WOOD POLE W/O BACK BRACING



DETAIL A



TREATED WOOD POLE WITH BACK BRACING

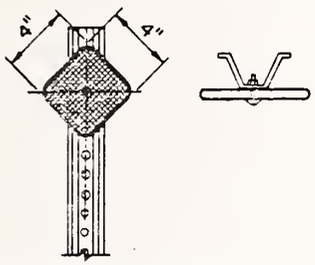
POLE SIZE	A	B	C	HOLE DIA	EMBEDMENT	GAIN
3" TOP Ø	—	—	—	———	3'-0"	2-3/4"
4" TOP Ø	—	—	—	———	3'-0"	3-1/2"
5" TOP Ø	—	1'	6"	2"	3'-6"	4"
6" TOP Ø	—	1'	6"	2"	4'-6"	4"
CLASS 4	—	1'	6"	2"	5'-0"	4"
CLASS 3	—	1'	6"	2-1/2"	5'-6"	4"
CLASS 2	6"	6"	4"	2"	6'-0"	4"
CLASS 1	6"	6"	4"	2-1/2"	6'-6"	4"

APPROVED BY: [signature]
ADMINISTRATOR - ENGINEERING DIVISION

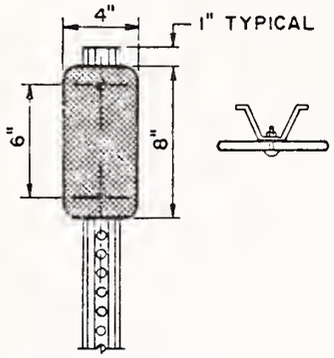
SIGNING
STANDARD DRAWING NO. 228

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
TREATED TIMBER POLE
SIGN SUPPORT DETAILS

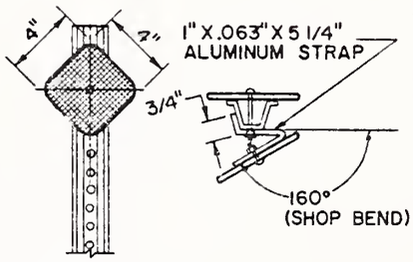
REVISED	10/1/75	4/1/79	
EFFECTIVE	2/1/75	6/1/79	



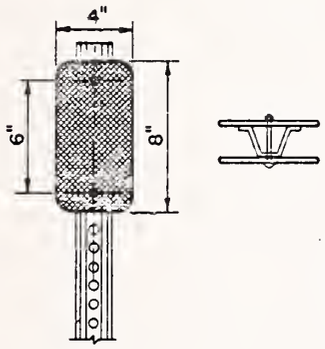
DESIGN A (WHITE)
DESIGN H (YELLOW)



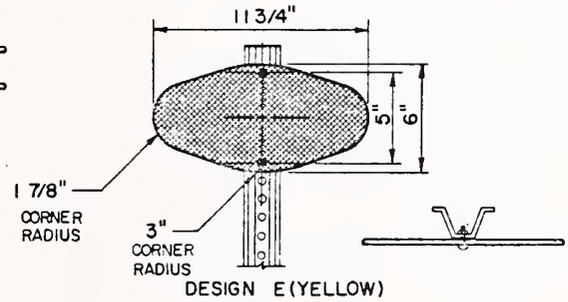
DESIGN B (YELLOW)
DESIGN G (WHITE)



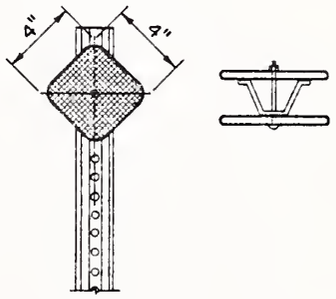
DESIGN C (WHITE)



DESIGN D (YELLOW)



DESIGN E (YELLOW)



DESIGN F (WHITE)

TABLE II

DELINEATOR	LEGEND
DESIGN "A"	
DESIGN "B"	
DESIGN "C"	
DESIGN "D"	
DESIGN "E"	
DESIGN "F"	
DESIGN "G"	
DESIGN "H"	

SIGNING STANDARD
DRAWING NUMBER 242

DELINEATOR DESIGN
AND LEGEND

REVISED	9/1/79			
EFFECTIVE	6/1/79			

APPROVED
BY
ADMINISTRATOR-ENGINEERING DIVISION